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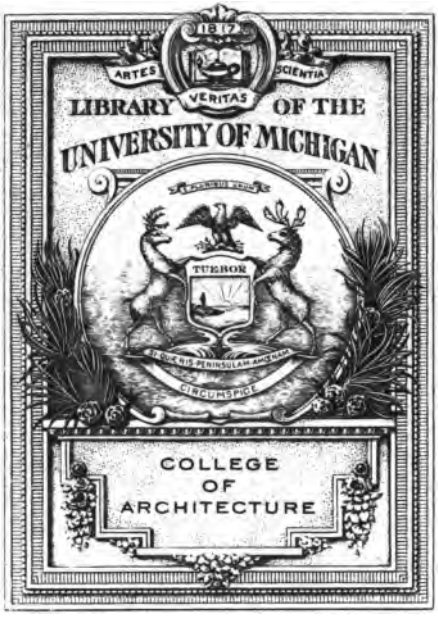
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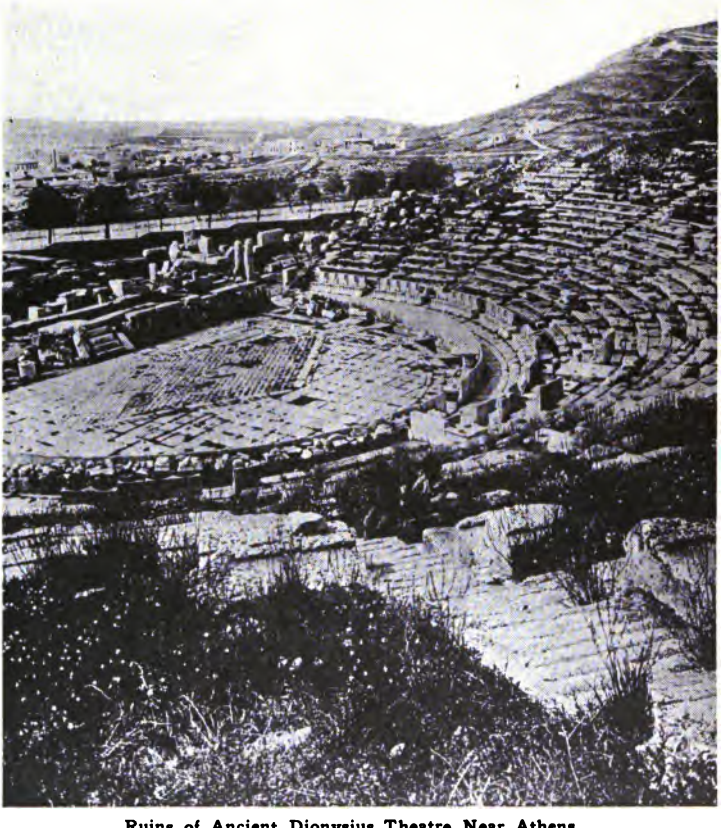

Ruins of Ancient Dionysius Theatre Near Athens.

Modern Theatre Construction

by

Edward Bernard Kinsila
Architect and Theatre Specialist

Large Type Edition

Forty-one Pages of Illustration
and Copious Marginal Reference Notes

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PREFACE

IN the preparation of this volume on "Modern Theatre Construction" no claim is made that this is a wholly original work. The book is more a compilation of the best obtainable data on the subject, interspersed with original ideas. Nor has any attempt been made to produce a technical treatise on the subject. This is rather a hand-book of practical suggestions intended primarily for the general reader, which may serve as a guide and reference for prospective owners, managers, architects or builders in search of reliable information on this type of structure.

The collection of the necessary matter for proper presentation has entailed a considerable amount of painstaking labor, and the author has often found it desirable to adopt the matured thought and in some instances even the very expression of thought of competent writers. To these authorities grateful and appreciative thanks are extended.

The absence of any serious or exhaustive published treatment of this important topic within the past quarter of a century, coupled with the present general tendency toward architectural uplift throughout this country, which aims at a simpler and truer form of art, renders the occasion opportune for the publication of such a volume as this.

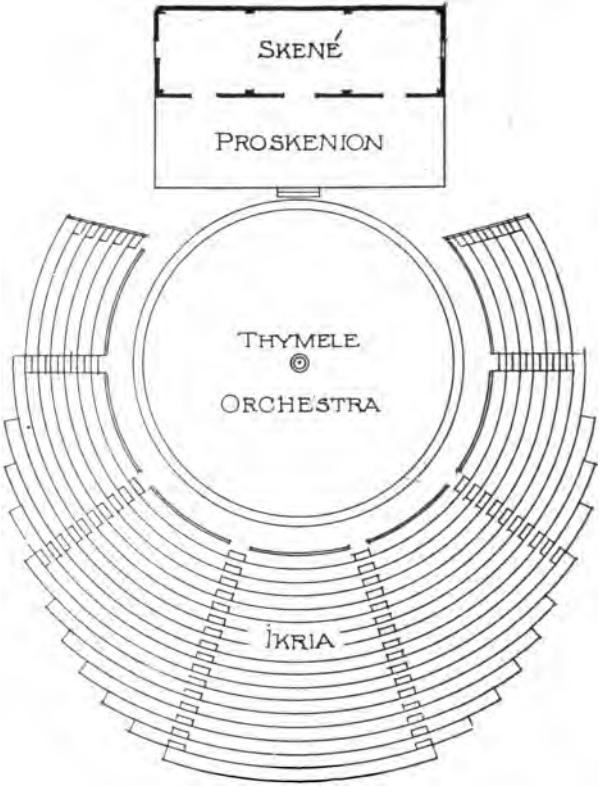
In illustrating or citing the work of other architects the writer disclaims any malicious intention in pointing out faulty features. He simply offers them as examples of defective construction to be avoided.

EDWARD BERNARD KINSILA.

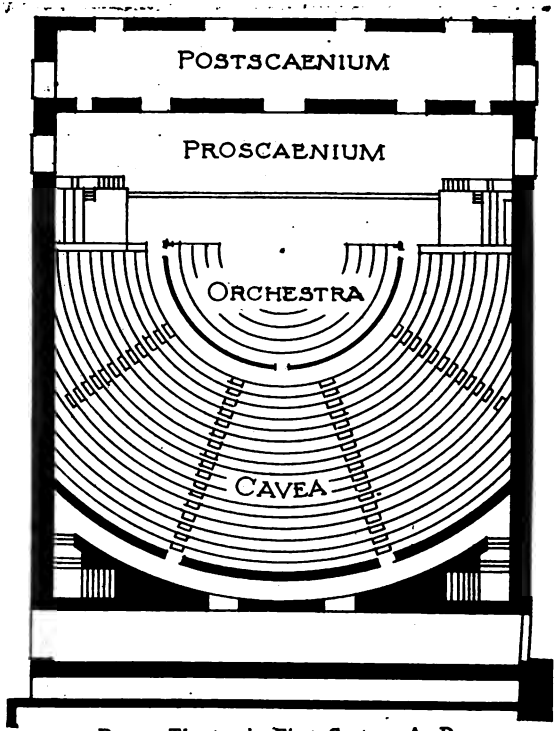
April, 1917.

PUBLISHERS' NOTE

THE publishers are pleased to announce that they have concluded arrangements with the author for a continuation of his interesting articles on theatre construction, more especially motion picture theatre building, in the *Moving Picture World*. Mr. Kinsila will have charge of the Theatre Construction Department, and will gladly answer in its columns any inquiry addressed to him pertaining to this publication or the subject of theatre construction.

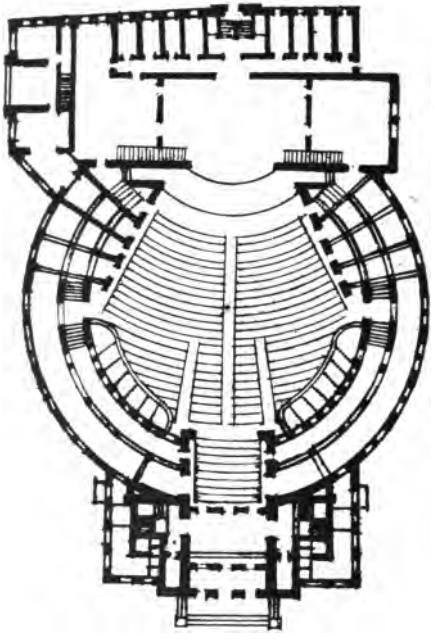


Greek Theatre in Sixth Century B. C.

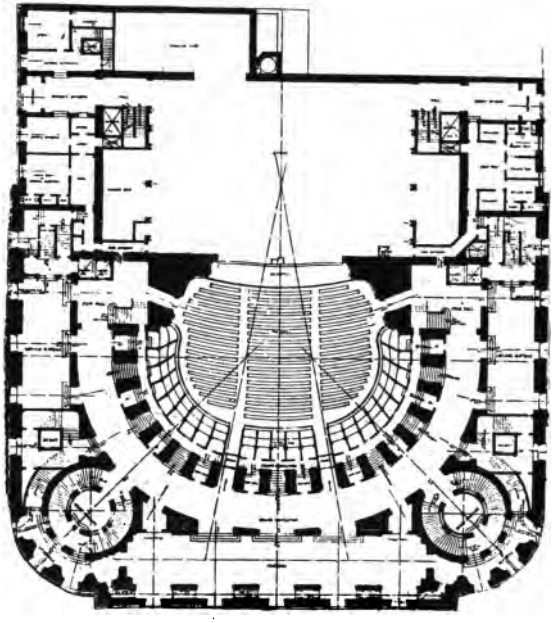


Roman Theatre in First Century A. D.

Evolution of Theatre—Comparative Plans of Two Ancient Types



People's Theatre, Worms, Germany



Century Theatre, New York City

Evolution of Theatre—Comparative Plans of Two Modern Types

CHAPTER I

A BRIEF HISTORY OF THE THEATRE

SINCE the inception of theatres their mode of construction has undergone a gradual formative evolution, invariably influenced by the everchanging uses for which these edifices have been intended. The history of the theatre dates from time immemorial. *The early Greek theatre evidently had no prototype. It was enormous in size and exposed to the open air, with no roof covering of any kind.

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*Chinese tradition claims the establishment of the Oriental theatre centuries before the Greeks came into being, yet it is unlikely that the latter race knew of its existence, and much less likely that they copied its form. The Chinese, like the Greeks, have ever been disciples of true art, and it is not impossible that in these days of convenient international intercourse many of the claimed innovations in advanced dramatic art may have had their inception in this remarkable country, where an older civilization has better borne the realization of true art. For centuries Chinese plays have been founded on noble legends, written in poetic language, and produced with the most artistic touches of suggestion, rather than mechanical realism. They portray the characters in the play by their dress and masks, as did the early Romans. Scenery and stage "properties" are generally regarded as accessories, although the author recalls seeing in China in 1890 essential exterior scenes represented by numerous folding screens, an idea afterward employed as an innovation by Gordon Craig. The writer also saw the stage of a Chinese theatre flooded with actors pouring through the auditorium aisles and across temporary bridges from the balcony, a highly effective feature supposed to have been originated by Max Reinhardt, and at another Chinese theatre was witnessed the revolving stage patented in Germany years later by Herr Lautenschlager. The elaborate and costly costumes, too, of the Chinese players are very remindful of the brilliant coloring of the celebrated Russian Leon Bakst.

Religious Character of Early Performances.

In its first form the Greek theatre consisted of a circular dancing-place or "orchestra" marked out by a narrow margin of flat stones. This space was reserved for the use of those participating in the exhibitions. The earliest performances were developed from the songs and dances dedicated to Dionysius, the god of wine and vegetation, and were intensely religious in their character. They were presented during annual feasts lasting several days, and the whole city kept holiday. All business was abandoned, and even prisoners were liberated to participate in the universal merriment. Every day, from morning until evening, was devoted without intermission to the rendering of these plays, which consisted of dialogues between the "coryphaeus," or leader of the chorus, and the other bacchanalians, the "coryphaeus" declaiming his lines from a sacrificial platform. At first this platform was located in the center of the orchestra, alongside the altar. Later, after its removal, it became the Greek stage. These sacred exhibitions were invariably preceded by some divine sacrifice, usually that of a "trayos" or goat. The religious significance of these plays, however, gradually diminished. The performances became more frequent, and the plays themselves came to be written more and more from a purely human point of view, and to the present day this motive remains the essential element of the drama.

Thespis was the first to introduce professional

actors in place of the "coryphaeus," and to this day actors are called "thespians." In the time of Thespis, the sacrificial table upon which he took his stand, surrounded by the choristers, was removed to a place immediately in front of the dressing booth erected just outside the orchestra, in which the actors changed their dress and masks. As the exigencies of the performances demanded, changes were made in the formation of the orchestra and stage building; the stage platform was widened and a proscenium built, with a series of dressing booths behind it.

Thespis, the First Actor.

The loss of one-third of the original orchestra space to make room for the establishment of the sacrificial table had necessitated placing the festival grounds at the foot of a hillside. Here the audience, seated one above the other like flights of steps in the space surrounding the orchestra, could have an unobstructed view of the performance. These wooden seats or rather benches were arranged in a semi-circle with the two ends prolonged. Their fatal collapse later led to their being replaced by stone seats with solid foundations, a fact which suggests that even at that remote period the safety of the public was an essential element in the construction of theatres. Apparently the first stone theatre was the ancient theatre at Athens, illustrated at the beginning of this chapter. It is today one of the most interesting ruins in the world. This edifice was probably erected near the middle of the fourth

The First Stone Theatre.

century, and undoubtedly occupied the identical site of the old wooden structure that preceded it. In many ways it embodied in more permanent form the main characteristics of that historic building, in which the plays of Aeschylus, Sophocles and Euripides had been declaimed.

High Cost of Ancient Plays

The vast importance of the religious plays enacted in these ancient Greek theatres is indicated by the enormous expenditure of state money required for their production. These sums were raised by obligatory duties levied upon the wealthy, like the income tax of the present day. Plutarch tells us that the expense of presenting a single play of Sophocles at Athens involved an extravagant sum equivalent to half a million dollars in American currency.

THE ROMAN THEATRE.

Centuries later, in the Roman era, the theatre came to be inclosed within boundary walls, but still without a roof. It had changed its form, and was now built more ornately and upon level ground. The exhibitions had become more secular, the altar had been removed, and all performances, whether choral, musical or dramatic, were transferred from the orchestra to the stage. The orchestra, considerably reduced in size, was given up to seats for the spectators. The first recorded stone theatre in Rome was built by Pompey in 55 B. C. It consisted of three floors separated by ample corridors, and each corridor was

approached by broad staircases that enabled patrons to reach their respective places. Although the Roman theatre was quite open at the top, a canvas sheet was later stretched across the auditorium, worked by means of pulley cords, to protect the auditors from the heat of the sun.

Decadence of the Ancient Theatres.

In the first century of the Christian era the Roman theatre developed mime plays, a species of true pantomime that was secular in its character. These unspoken plays and the gladiatorial games of that day were rivals for the public favor, and the Church was not slow in denouncing this so-called prostitution of the religious stage. From that time began the decadence of the ancient theatre, and it lay dormant until its revival in the mediaeval period, centuries later.

Just as the ancient theatre, originally designed for joyous display through the religious enthusiasm of a devout people, and later assuming a more secular aspect that necessitated corresponding changes in architecture, so, too, has the theatre of a later civilization continued to advance with like physical changes to accommodate its new uses. It is not necessary to trace the history of the theatre through its various vicissitudes to the period of the housed-in theatre of mediaeval Europe, and thence onward, to demonstrate that the seating arrangement of an almost prehistoric generation dictated the ultimate conformation of the classic hemicycle now in use.

THEATRES OF MIDDLE AGES.

The early days of mediaeval Europe witnessed the introduction of liturgical drama and miracle plays, founded on events chronicled in the New and Old Testaments. In England, as in France, the church became the cradle of the drama. Then followed mimed mystery plays that later developed into secular pantomime. Following the examples set by the early Romans, these religious pantomimes degenerated into licentious spectacles, and historical comedies and classic drama were introduced to offset them.

Real Theatres of the Middle Ages.

Following the days of the ancient theatre and up to the beginning of the seventeenth century all plays had been enacted by the elite of society in public halls or colleges. In that period real housed-in theatres as we now know them made their appearance in France. The most noted one of these was the Hotel de Bourgogne, a vast, low-ceilinged edifice that accommodated about two thousand persons. The stage of this theatre was of extraordinary depth, and it was divided in the middle by draperies when the scenes did not require its full depth. Rows of candles, that required constant snuffing, were placed along the front of the stage to aid in its illumination. Above the stage itself was suspended a chandelier with four branches, each containing a long yellow candle. There were in the auditorium two superposed rows of boxes, each box fitted with wooden benches to hold some dozen spec-

tators plunged in semi-obscurity. The pit, in which the audience stood or moved about at will, was no better lighted than the boxes.

The Dawn of Good Drama in England.

About the time that the Hotel de Bourgogne and other real theatres were created in France there appeared as an actor and playwright on the English stage that marvel of genius William Shakespeare, who later became the manager of the famous Globe theatre in London. The Globe theatre was merely a summer theatre, open for three or four months in the year. Judging from the vivid descriptions of the theatres of that period the manners of theatregoers were extremely unconventional. Although an active interest in the drama pervaded all classes, respectable young girls were not allowed to attend the theatre in those days, the audience in the better parts of the house being mainly composed of the gay set. The women in the boxes wore velvet masks to hide their faces and smoked pipes during the performance. The few seats in the theatre were stools, and people of quality brought their own stools. There stood in the Globe theatre of which Shakespeare was manager an immense stoup of English ale, from which every man could quench his thirst at will.

Early English Theatres.

The establishment of permanent theatres in England dates from the latter part of the sixteenth century. This period marked the beginning of the Elizabethan drama. Female characters of the matronly type of Lady Macbeth were imper-

sonated by men, and for the more delicate, maidenly parts, such as Juliet and Imogen, recourse was had to the services of young men, who were remunerated in proportion to their beauty and distinction.

The first of these permanent theatres were erected in the fields outside of London, but under the jurisdiction of the Lord Mayor and City Council. Among these were "The Theatre," "The Curtain" and "The Blackfriars Theatre." They were inclosed within side walls, with the center space open to the air, while against the side and rear walls were arranged tiers of benches as in the ancient theatres. The stage was raised about four feet from the floor, and was separated from the pit by a balustrade. A big open room above the stage was used by the actors to dress in, and a square roof protected this and the stage from the rain. Another narrow, circular roof covered the tiers of seats against the walls. A writer of that period says, in describing these theatres, that "seen from a distance they looked like enormous towers, outtopping the trees and houses that surrounded them."

Troubles of the Early European Theatres.

During the seventeenth century the theatre experienced troublesome times in France through political intrigue. The celebrated Comédie Française and the equally famed Palais Royal were several times established and suppressed as national theatres during that period. In the year 1660 there were but three great public theatres in

all Paris: the Hotel de Bourgogne, the Theatre du Marias and the Palais Royal, although theatres were held in high popular favor. In England, too, the same experience befell the theatre because of civil wars. During this period actresses for the first time were accepted with favor upon the English stage. Painted scenery was introduced and oil lamps were substituted for candles. Up to that time scenery and "properties" had not been employed on the stage, such accessories being described in the lines of the play, and uttered by the stage declaimer.

THEATRES OF MODERN TIMES.

The early theatres of a later period catered wholly to the cultured classes without regard to the masses. These were Court theatres, maintained at the expense of the various sovereigns, and National and Municipal theatres, supported by the different governments. There were also subscription theatres whose cost was defrayed by private subscription instead of from the public purse. Naturally the sole aim of all such theatres was the advancement of art and education.

The Modern Theatre a Commercial Undertaking.

Coming to the private theatre, we observe the same tendency toward advancement in architectural conformation. The private theatre of Continental Europe is sometimes aided by subsidy, but whether so aided or built entirely from private funds, it is always designed with a manifest interest in art and architecture, while in English-

speaking countries the theatre is regarded solely as a moneymaking institution. In these countries it is built by a speculator, an investor or an ambitious actor, who, for profit only, caters to the pleasure of sensation seekers usually devoid of any appreciation of architecture or art. There is no effort to emulate the worthy example set by the ancient Greeks, who were conservative in their art and strictly opposed to realism.

Different Types of Private Theatres.

Included in the general class of private theatres there are several distinct forms, each built on lines intended to serve best its peculiar use. These embrace the music hall or variety theatre, and the hippodrome or coliseum. The former is so like a regulation theatre, except, perhaps, for the addition of a restaurant or drinking pavilion, that it does not require special mention, and so few hippodromes are now built in this country that lengthy descriptions of them, as hippodromes, would unduly encumber these pages. However, as large central theatres devoted to the presentation of motion pictures on a grand scale they will receive due attention.

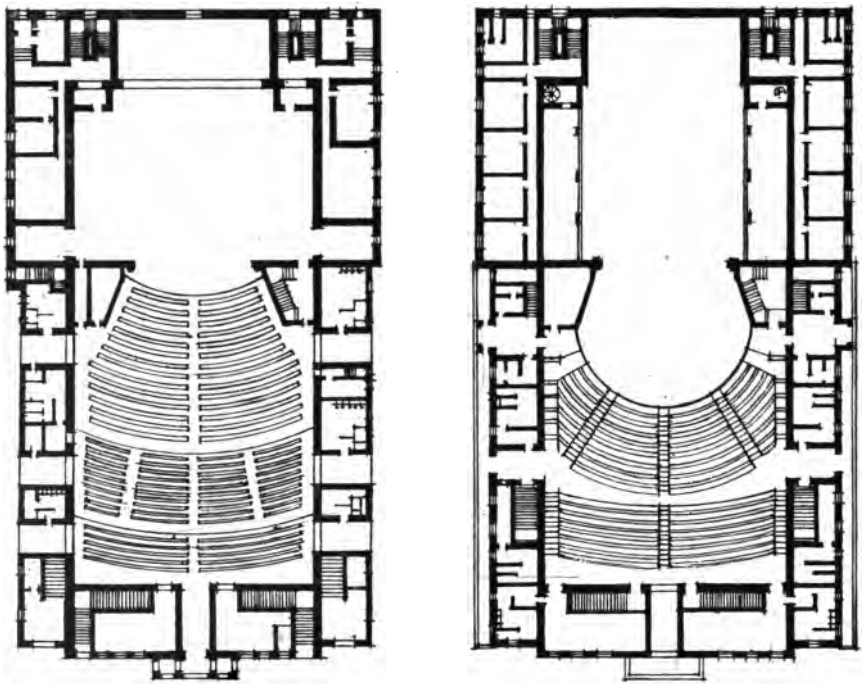
The pioneer of the private theatre in Europe was the People's Theatre in Worms, Germany, founded when the city contained less than 25,000 inhabitants. It exists today and is a remarkable institution, comprising assembly rooms, a restaurant and a winter garden. A diagrammed plan of this theatre is shown among the illustrations of the "Evolution of Theatres" (Pages 7 and 8).

Model Safety Theatres.

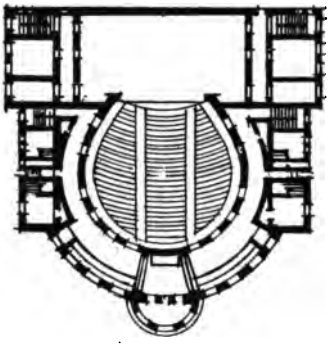
The destruction by fire of the Ring Theatre, in Vienna, on December 8, 1881, with the appalling loss of eight hundred lives, aroused all Europe to the necessity of devising a model safety plan for theatres, and many enterprising architects offered models that have had a lasting influence upon theatre construction. Alfred Derbyshire, an English architect, designed a new model that was adopted by Henry Irving (later Sir Henry Irving) for the Lyceum Theatre, London, and which still stands, slightly altered, as a model of capacity and safety. Franz Roth of Vienna suggested another form, which was carried out in the Raimund Theatre of Vienna. Another and more unusual design was proposed in Germany, and afterward adopted for the erection of the famous Wagner Opera House at Bayreuth. At the present writing there appears to be a decided tendency toward a more general adoption of this form in European advanced theatres.

AMERICAN THEATRES.

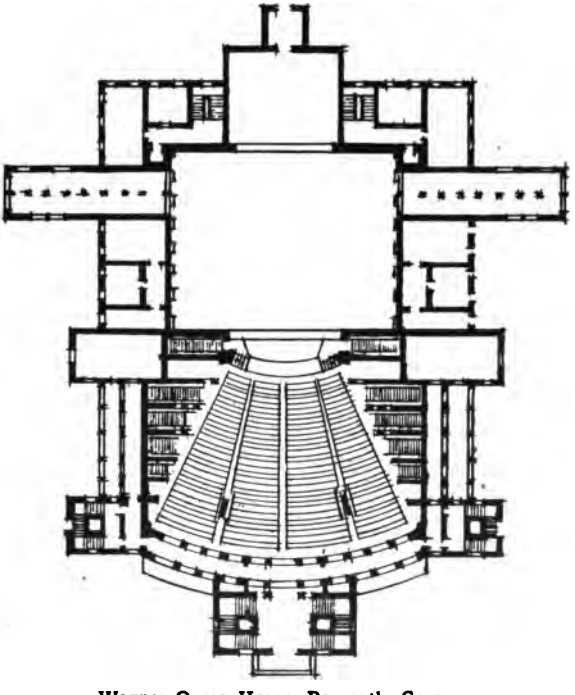
There is very little recorded history of either the American drama or theatre before the Revolutionary period. "Androboros," written by Governor Hunter in 1714, is the single notable exception. Certain it is that the sentiment of those rebellious times exercised a potent influence on the development of both theatre and drama. In the few years preceding the Revolution theatres sprang up rapidly in New York, Philadel-



Main Floor and Balcony Plans, Lyceum Theatre, London, Eng.



Raimund Theatre, Vienna



Wagner Opera House, Bayreuth, Germany

phia, Annapolis and Newport, in open defiance of the religious opposition directed against the so-termed "profane stage plays" of that day.

Theatre Troubles in Revolutionary Times.

During the tumultuous days preceding the Declaration of Independence, Lewis Hallam's English players, who had been presenting Shakespeare's plays with great success for the first time in this country, were forced to migrate to the British West Indies, not to return for many years. One or two theatres were torn down by enraged republicans, and other playhouses were seized by the British, who formed companies of players from among their soldiers and officers. Major Andre, besides being an actor in these companies, painted scenes for New York and Philadelphia theatres, never dreaming that they would be used later in Manager Dunlap's great production of "Andre," as scene drops to depict the place where Andre himself had been captured as an English spy.

First Real American Drama.

The drama of that period dealt largely with the subject of the Revolution, pro and con. William Dunlap was the famous American producer of those days, and his influence extended well into the nineteenth century. The first real American play was "The Contrast," a comedy conceived in 1787, based on the now well-worn comparison between the native-bred American and the American who has become an Anglomaniac. An innumerable number of Indian plays, glorifying the savage, also held the stage thereafter for

many years, partly as a result of Edwin Forrest's realistic interpretation of the Indian in John Augustus Stone's "Metamora." After this period many tendencies were at work in our drama. With the coming of the Civil War, however, play acting again waned, and many theatres were closed. When the war was under way the theatre business again started and went through a period of extravagant farces, or burlesques, whose crudeness and indecency reflected the moral demoralization then rampant. After the war was ended a reactionary element arose against this abuse, and a second creative period was instituted under the superior management of the eminent Augustin Daly.

J. B. McElfatrick, the Father of American Theatres.

The greatest individual strides in American theatre construction have been effected through the personal endeavors of a single architect, Mr. J. B. McElfatrick, of New York City, who should be revered as the Father of American theatres. Thirty years ago theatres in this country were designed and constructed along the sames lines as their English prototypes. They had the same subdivision of the seating on the main floor: the American distinction between the parquet and parquet circles corresponding to the English separation into stalls and pit. They had the same lyre-shaped balcony, the same stage projection or apron, and the same extravagant and distracting ornamentation. Mr. McElfatrick, who had never visited Europe, changed all of this, and to him

was intrusted the designing of most of the new American theatres of his day. He perfected the sight lines, arranged the seating to be continuous from front to back on the main floor, and made the balconies flatter and deeper. The useless projecting apron of the stage also disappeared in his design. Since the death of this genial old gentleman theatre designing has not substantially advanced in this country, except perhaps for a marked tendency toward simpler decoration. Theatres have multiplied in number, but they are all more or less replicas of the McElfatrick model.

A Great Impetus in Theatre Building

Before the advent of Mr. McElfatrick there were fewer than ten theatres in the City of New York, and in other large cities throughout the country they numbered scarcely one to every 60,000 inhabitants. There is today no spot in the world that can boast of so many so-called "first class" theatres in so small an area as that narrow belt in New York City that is termed "Broadway," and still the supply is inadequate to the demand. At the present writing there are more new plays clamoring for admittance and a hearing in New York than ever before in local histrionic history. The greatest impetus to theatre building throughout this country has come within a comparatively recent period. Today the proportion in many cities runs as high as one theatre to every 10,000 persons. Theatres with large auditoriums and great seating capacity were in universal demand a few years ago; now smaller and

more intimate theatres are desired. Houses of great capacity are now being erected solely for popular priced variety theatres or picture houses

This change from the large to the small theatre is no doubt due in a measure to the influence of the stage reform movement and the uniform success of comedies, farces and light dramas in small intimate theatres, as compared with the failure of similar plays in larger houses. This result has not failed to impress the mercenary theatrical manager.

Superiority of the American Auditorium.

Aside from its seating facilities, the American auditorium in its form and construction is superior to that of European countries, not excepting England, where the accommodations for comfortable seating are excellent. European theatres, including those of England, often seat from eight hundred to a thousand persons on the main floor in unbroken rows of thirty seats without dividing aisles. This is an inconvenience in time of danger that would not be tolerated by any building laws in this country. The seating superiority claimed for the English theatre lies entirely in its provision of space between the rows of chairs that permits patrons to reach interior seats without causing anyone to arise. The corrections now necessary to make the American auditorium superior to the auditorium of all other countries is an increase of only four inches in the dividing space between the rows of chairs and the substitution of comfortable low-backed chairs

for the high-backed variety now in general use, which induces a slouchy and dangerous posture. Sitting with the pressure of one's whole weight on the same bone at the base of the spine interrupts the blood circulation of the lower extremities, and often produces fatal results. In addition to these needed changes in seating, the audience hall would present a more cosy appearance if surrounded at the rear and rear sides with a foyer behind inclosed boxes. This arrangement would limit the area to be supplied with sound and would also improve the promenade facilities between the acts.

Latest Form of Theatre.

The most recent development in theatre evolution is evidenced in the motion picture houses, of which there are now over 20,000 in the United States, representing an investment of nearly $500,000,000. Their productions appeal to the visual sense, and the success of this silent drama has been so remarkable that it has exercised a potent influence over the construction of regulation theatres. One of these influences is the elimination of the top gallery, originally designed for the patronage of the poor. The merit and cheapness of moving picture entertainments have brought unprecedented success to its theatres and an average daily attendance of over ten million patrons, one in every ten persons in the total population of this country.

Nollendorf Theatre, Berlin

Open Air Greek Theatre of California University. University Orchestra Rendering Symphony Concert

CHAPTER II

CONTROLLING ELEMENTS

IT has been demonstrated in the preceding chapter that certain elements have governed the theatre in the evolution of its conformation. Many of the same elements that control it as an institution also exercise a subtle influence upon its physical construction. Baron de Meyer, a foreign critic of note, recently wrote in an article published in a leading American magazine that the people in this country who are responsible for the artistic development of the drama are for the most part entirely incompetent. He said that their productions lack the keynotes of modern stagecraft: simplicity, suggestion and atmosphere.

Inappropriate European Spectacles Usually Imported.

Even where large productions have been imported from Europe, improper selections have been made. They have all seemed to the Baron like glorified editions he thought impressive in his childhood days. "Sumurun" is the one production of that master of stagecraft, Max Reinhardt, that has been imported into this country, and although it has met with wonderful success here, no effort has been made to introduce the more artistic and successful works of this consummate artist, such as "The Miracle," "Oedipus Rex," or any of his wonderful productions of the immortal Shakespeare.

The efforts of theatrical managers, in the Baron's opinion, have been falsely centered on the box-office. He did not deny that we have superior artists in America, such as Robert Jones and Joseph Urban, both capable men, whose talents are not sufficiently employed in regular theatrical enterprises, and when so engaged are usually restricted under specific directions. Even Leon Bakst was commissioned to execute the stage settings of a portion of a production at the New York Hippodrome, without any visual knowledge of the immense stage proportions of that edifice, and the production, in consequence, fell far short of the usually marvelous artistic merits of this superior craftsman.

Plays Largely Salacious.

Heywood Broun, the scholarly critic of the *New York Tribune,* upon being solicited for advice by a reader of his newspaper on the following question: To which theatre could he safely take a select theatre party composed of about fifty respectable persons, where they could witness an interesting play devoid of salacious lines or sex problems, and one that would not bring a blush to the face of any father or mother in the party? was forced to reply in the columns of his paper that out of over forty plays then showing in New York, only five would answer the purpose, and he was able to recommend only one of these for anything like superior merit.

When one scans the names and traces the antecedents and history of those responsible for the

kind of intellectual fodder that is supplied to theatre patrons one is not greatly surprised that theatre patronage has degenerated to its present standard. All manner of catch-penny devices have been employed to gather the glittering dollars, the chief among which has been the "star system," which is now apparently sinking into oblivion. False commercialism once dictated the employment of a star or stars in preference to the maintenance of a well balanced caste. Fine speeches and telling lines, important for lesser members of the company, have been appropriated by the star to the great detriment of the play, and more importance has been placed by the management on featuring the stellar attraction than upon the merits of the play itself. Unthinking competition and diligent press exploitation of stars have increased their salary demand beyond any managerial idea of profit, and a revulsion of feeling has now resulted. All of this might have been averted had less attention been accorded to the star and more to the playwright, for, after all, it is the play that really counts.

Bad Influence of the "Star System."

At the present writing more thought is bestowed upon the play in this country than previously, though it is not yet given the consideration it deserves. There is too little atmosphere and not enough suggestion. The spoken word is merely an accessory of the drama, and not its heart. American plays are amateurish and suffer from a surfeit of strength. There is a Broadway term

"The Play with a Punch."

in common use that exactly expresses this quality, "the play with a punch." The play with "the punch" is written solely for that "punch," and is a sensational dramatization of the violent moments of life, dealing with surface aspects, rather than with underlying causes. Only an American audience with keen imagination would patiently endure the illogical and dull moments between and leading up to the thrills of that so-called "punch."

Stagecraft a Distinct Art.

Stagecraft is a separate art in itself, that aims to inclose the drama in a framelike structure. The first principle of dramatic art is its primary dependence upon action, and the setting should be an unobtrusive background designed to concentrate attention on that action, not to detract from it. A certain American arch-apostle of stage realism has gone so far in his false naturalism as to make it a common practice to reveal in all his productions a completely furnished second-room beyond the scene of action, or perhaps to introduce with distractive accuracy of detail, through some opening, a perspective background. Nothing is left to the imagination, and every effort, often in extremely bad taste, is made to disturb the continuity of interest in the play.

Intense Drama Now Needed.

Intense dramas with subtle beginnings, dramatically built up to an emotional climax, are needed to win the return of intelligent audiences to the theatre. There has been too much resort to cheap sensational methods; too much desire

to attain results by inappropriate comic relief and melodramatic turns; and not enough force that is strong, direct and well blended with subtlety. Too much credit has also been given to technical stagecraft in the production of these plays, and not enough to the merits of the play itself. Mistaken attention to detail that fails in its true purpose and diverts attention from the play has been too widely heralded as the highest form of dramatic art.

The Mercenary Manager.

The American manager is too intent on immediate profits and too much afflicted with blind commercialism. He knows too well the tricks of the trade and has little or no conception of the art of the stage. As at present constituted, he is either incapable or persistently unwilling to persevere in any endeavor to improve the public taste, and in consequence the more intelligent element of the community has been alienated from the theatre. Occasionaly, when some European success is imported into this country in its entirety and played at a suitable theatre, one observes a class of audience quite unfamiliar in the ordinary theatre. Edwin Björkman, the eminent Norwegian critic, has truthfully stated that the American theatre was organized as a vast gambling business, and he opined that the professional gambler was the last man in the world to take a genuine risk. This statement, in a measure, accounts for the American managerial disposition to copy

things that have already succeeded rather than to undertake anything new.

European Tendency Toward Dramatic Art.

On the Continent of Europe there is a fast-growing inclination toward high art in every branch of play production. This tendency also highly influences the character of theatre decoration and construction, and the most advanced development in this direction is in German-speaking countries. The immense popularity of the playhouse, the dominant spirit of thoroughness, and the popular interest manifested in the drama have done much to give the German theatre a prominent position in social life. There the desire for playgoing, encouraged by the general opportunity to subscribe for a series of performances at reduced rates, have rendered the middle classes as competent critics of the drama as the more highly educated members of the community. In English-speaking countries, especially America, little material progress has been made by the theatre. Gordon Craig, an eminent English producer of the advanced school, says in his book "Toward a New Theatre," that "These countries are now building theatres sixty or seventy years behind the times," an indictment that, to a great extent, is true.

German Theatre Specialists.

Professor Max Littmann, a famous German architect, has done much to revolutionize ideas in theatre construction, and years before him came another German specialist, Gottfried Sempner, the originator of the radial system of planning, now

generally adopted throughout the world. To his memory belongs the credit for the formation of the recent school of theatre architecture. The Art Theatre of Munich and the Royal Theatre at Stuttgart, comparatively a small provincial town, are the product of Professor Littmann, and both present models of artistic utility.

The advanced idea of the drama has led to the erection of many small theatres in Germany, modeled after the Art Theatre of Munich. The seating in these small theatres is confined to a single floor. They lack both orchestra wells and footlights, and have adjustable proscenium openings that expand or contract to meet the requirements of the play. They are equipped with every modern device known to the theatre, and many of these innovations could easily be incorporated in newly built theatres in America, and several of the important ones by slight alteration in older theatres. The artistic design of these miniature structures is distinctively simple and is not more definitely expressed in the design of the larger and more pretentious advanced theatres. To the American eye their interiors resemble public halls rather than theatres.

The New School.

This new spirit of experiment has to a great extent invaded Russia, France and England. Leon Bakst, the Russian painter and famous stage designer, and Constantin Stanislavsky, stage director of the Art Theatre, Moscow, Russia, are propagating the cause in that far distant land,

while Maeterlinck and Brieux are guiding its destinies in Belgium and France. In England the reform interest is made more manifest in advanced playwriting, and to a lesser degree in logical stage production. Closely following the examples set by the Scandinavian trio, Ibsen, Strindberg and Björnson; and the German dramatists Hauptmann and Sudermann, contemporaneous writers of the solid worth and brilliancy of George Bernard Shaw, John Galsworthy and J. M. Barrie are deeply concerned in presenting intense and sterling drama for the English-speaking stage, with the superior assistance of Gordon Craig and Granville Barker as artist stage producers. Many of the more successful plays of these writers have not yet been introduced in America.

"Dramatic Incubators."

This idea of change has, in a lesser degree, affected America. What has been an achievement in Europe is only a substantial promise in America. The emancipation of the superior class theatre from incompetent hands is already indicated; the handwriting is upon the wall. It is to the amateur theatre or college that one now looks for experimental development and progress. These "dramatic incubators" are often situated in towns remote from theatrical centers; in towns like Madison, Lake Forest, Cambridge, Carmel, Wellesley and a dozen other similar places that are not indicated on the showman's map. In

most advanced American colleges dramatic art has been added to the curriculum.

The Greek open-air theatre at Berkeley, California (see illustration preceding this chapter), is an excellent example of the type of theatre just referred to, in which experiment for the uplift of the drama is being carried on. In other centers of learning and culture similar efforts are being made by those interested in art for art's sake, and permanent homes for advanced dramatic art have been freely established, with more to follow.

INFLUENCE OF OPEN-AIR THEATRES.

Beneficial Influence of Open-Air Theatres.

The open-air theatre is one of the most promising influences in the dramatic world today. It is a truly democratic institution that brings together great numbers of people interested in the high motives of art and cements their friendship by a common artistic purpose. Because of the rank commercialization of the regular theatre the outdoor drama has proved a strong social factor in many communities. A word here as to the erection of such a theatre may not be amiss. In constructing an open-air theatre it should, if possible, face the east, and its plan should be symmetrical, with spacious approaches from the foreground through circular colonnades and descent to the auditorium by broad flights of steps that lead to each terrace. These auditorium terraces should be bounded by balustrades, with ap-

propriate sculptured figures at intervals, and the orchestra plane should be semi-circular and capable of being divested of seats when the occasion requires.

The stage should have a straight front with a proscenium formed by pylons, surmounted on each side by large groups of sculpture. The rear of the stage should be formed by a colonnaded screen, through which vistas of trees and water may be seen by the audience. In the embellishment of the open-air stage there is little that the stage decorator can add to nature's background of trees and shrubs. The keynote for outdoor stage setting must be simplicity, and everything introduced into the setting should be massive in its character. Out-door productions, too, should be of a certain largeness and characterized either by classic dignity and severity or by idyllic loveliness and charm. As a rule pageantlike plays that delight the eye by rhythmic movement and color are the most successful in the open.

The Little Art Theatres.

But it is not in the open-air theatre that the best work is being done. The most important innovations have been made in the little theatres created by amateurs throughout the country for the presentation of advanced plays. Many of these little playhouses, modeled after the Art Theatre of Munich and other little theatres in Germany, have been erected by American disciples of this new movement. These small theatres started in America with Maurice Browne's Little Thea-

tre in Chicago, which seats only eighty-nine persons when crowded, and the Toy Theatre of Boston. Maurice Browne at Chicago and Livingston Platt, the stage director of the Toy Theatre, have always worked as artists and never as realists in the production of their plays. Mr. Platt is a Harvard disciple of the famous English stage producer, Gordon Craig.

A more ambitious step toward advanced theatre construction has been made by Winthrop Ames, a Boston millionaire, in the erection of the Little Theatre in New York (pictured elsewhere in this volume). A host of small theatres in New York have followed this latter venture, each housing a superior company of players vitally interested in advanced dramatic art, who wholly produce their plays without recourse to the customary theatrical sources. The Punch and Judy Theatre, The Band Box Theatre, The Neighborhood Playhouse, The Nine o'clock Theatre and Bramhall's Playhouse are numbered among these and all have enjoyed marked success during their initial season at advanced prices, and in consequence more of these tiny theatres are being built. In Philadelphia there is also a Little Theatre, and elsewhere this type of artistic theatre is springing up with encouraging rapidity.

Civic Theatres.

Enthusiastic reformers of the drama profess to believe that in the success of these miniature theatres they see the promise of a great future for similar small houses throughout America.

They believe their advent means the realization of the much discussed "Civic Theatre." There is hardly a village hall throughout the country that with a few ingeniously contrived alterations, including a well-devised and colored proscenium arch, might not be employed to present effectively these advanced dramatic productions. The proper presentation of many advanced plays calls for shallow stages and ingeniously angled lighting, which causes the actors to stand out like figures on a bas-relief panel. All of these effects and many others would be easy to accomplish in such playhouses.

Modern Stage Settings.

The stage settings could also be simplified to artistic advantage. Neutral-colored draperies or folding screens could be employed for backgrounds, and while the entire elimination of "flats" might be impossible there need be no perspective lines painted on the "flats" used. All such lines should be substantial and stand out in plastic relief, so that the audience could perceive the same effect from any angle. The "properties" employed upon the stage should also be real. Such scenery and "properties" need not be more difficult to transport than the present kind, and there is no good reason why the expressed hope of these ardent reformers should not be fully realized. Already Charles Edison, a son of the noted inventor, Thomas A. Edison, has equipped the double parlors of a brownstone residence at No. 10 Fifth Avenue, New York

City, as a tiny theatre, which he calls "The Little Thimble Theatre." In this small playhouse, seating less than one hundred persons, modern plays of merit are successfully produced by Guido Bruno, an amateur stage director of the artistic type.

Theatres for Children Necessary.

Strangely enough, America has also neglected one of the most important and fruitful uses of the theatre, namely, the amusement and education of children. There are no Marionette theatres here such as thrive all over Europe, nor have we regular theatres devoted to the presentation of children's plays like "Cinderella," "The Sleeping Beauty," "The Fairy Queen," or "The Pied Piper of Hamelin," and a host of similar plays to instill in the young a love for the beautiful and an active appreciation of all that is wholesome and pure. Performances of this kind would assure a future reflection of those ideals when the children have attained maturity.

What America needs is a true sense of art to glorify its ideals. If Americans looked more to advanced ideals of art and less to the commercial element all would be materially benefited and in the end even monetary interest would be considerably advanced.

Interior View of Neighborhood Playhouse

An Art Theatre in the Slums of Grand Street, New York

CHAPTER III

SITE SELECTION

THE first and one of the most important essentials in the erection of a theatre is the selection of its site, which must be large enough to encompass the proposed scheme in its entirety. For architectural and other reasons an isolated site is preferable, and the more exposed the site the more imposing may be the finished structure. A corner site with attractive façades on two streets is next in desirability.

Isolation of Site Not Essential.

Sentimental reasons are often greater than structural reasons for the selection of a theatre site, yet structural restrictions to a location are neither so great nor so frequent as it is generally supposed. It is possible to construct a playhouse with proper regard to correct planning and the safety of the audience, where the site is only partially isolated or even almost inclosed. The party wall without openings at the rear of the stage, for instance, very slightly adds to the risk from fire or panic, although close proximity to adjoining property might materially affect the architectural appearance of a theatre. In fact, there would be no serious objection to both the front and rear division walls of a theatre being party walls, provided the side walls were left free for exits. So far as the convenience and safety of the audience are concerned such an arrangement, with a lobby

in the rear and entrances at each side, with abundant exits on both sides of the theatre opening directly on to the street, would be excellent and would permit of the theatre being emptied in record time in case of danger.

Location for a Large Central Theatre.

Another important requisite is the location of the site. Much depends on the kind of theatre to be built. If it be a central or general theatre for the patronage of the masses, the site should be on a well lighted thoroughfare in a populous section of the community, and large enough to permit of the erection of a massive and imposing structure of great capacity with all the alleys demanded by law. The presence of street cars or other means of transit is a decided advantage. The size of the plot would be governed largely by the capacity required. A plot 120 feet wide by 175 or 200 feet in depth for the auditorium and stage, with ample space on the street for a commodious lobby, would be sufficient for comfortably seating over 2000 people. The lobby section is the only part that need be located directly on the street, so long as provision is made at all necessary points for numerous passages reaching the open streets.

Site for a Neighborhood Theatre.

For a medium sized theatre intended for the patronage of a special class or neighborhood the site should be located in the busiest, best lighted street in that particular section. Its size, to seat about 1100 to 1300 people, should be 100 feet by 120 feet for the auditorium and stage, with an

entrance space on the street of not less than 25 feet in width.

Should a smaller form of theatre for the display of motion pictures or for other uses be desired, it would be well to choose a site of sufficient size on the busiest shopping promenade of the district to be exploited, large enough to accommodate a house of the requisite dimensions, with such alleys or courts as are demanded by law. Long and narrow plots should be avoided, as an auditorium whose width approximately equals its length is more symmetrical and serviceable. Even where extraordinary length is demanded in a picture house to secure increased capacity a rectangular-shaped auditorium will not seriously matter, provided there be ample width.

Smaller Theatres.

While the public will go anywhere to witness a successful performance there is not the slightest doubt that given the same play, the same actors and the same management, the theatre in a good position must show considerably better financial results than a badly located house.

Good Location Is Essential.

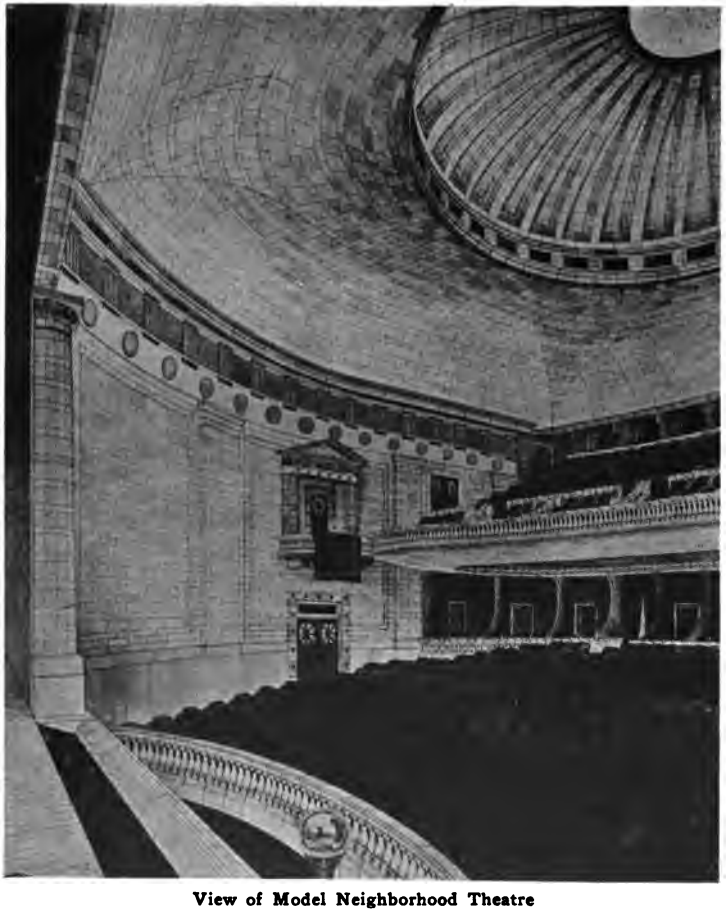
The physical nature of a plot often seriously affects the plan of a playhouse. A steep surface incline of the premises will frequently influence the pitch of the floor and thus regulate the relative position of the stage and entrance, provided a change of the location of these would not seriously affect the commercial or artistic aspect of the theatre.

In the absence of streets, municipal regulations

usually permit the substitution of open courts or alleys; still an alley, however wide it may be, never affords the same opportunity as a street for a becoming building elevation, nor does it allow equal facilities for safety.

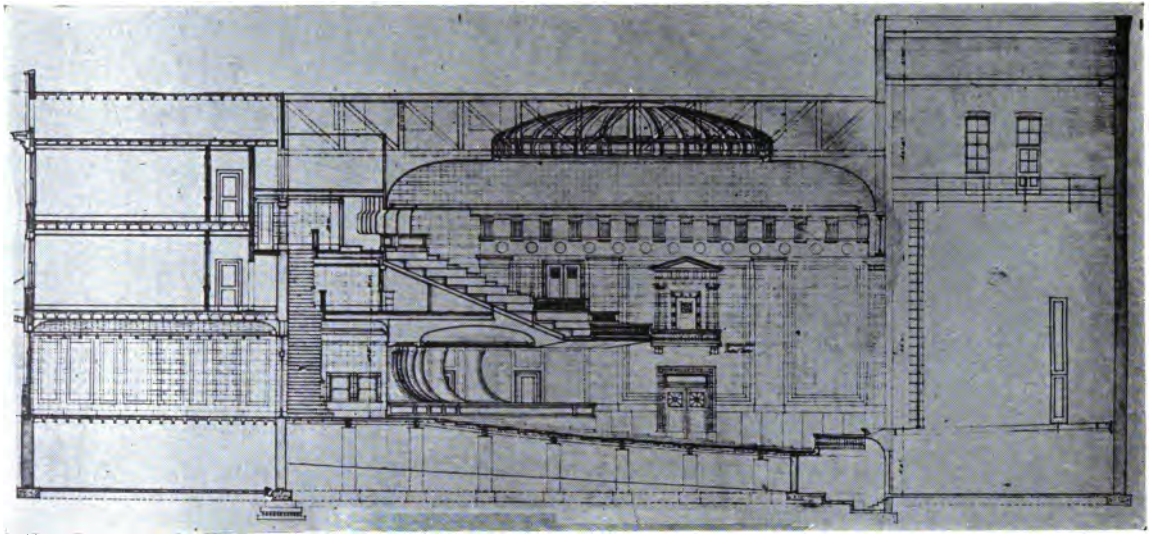
Topographical Survey Is Necessary.

A topographical survey of the plot should be made before definite plans are prepared, indicating in cross and longitudinal ten-foot sections the ground conformation and various levels, in order properly to determine the foundation and grade lines, and to estimate correctly in advance the depth for sewers and water connections.



View of Model Neighborhood Theatre

For Description and Diagrams See Pages 205-212



Longitudinal Section Model Neighborhood Theatre

CHAPTER IV

DESIGNING AND PLANNING

GENERAL ARRANGEMENT

FOR the reasons before stated, the designing and planning of theatres in this country have not exhibited the same general progress as have the designing and planning of other types of buildings. Few theatres can compare with modern hotels, either in respect to beauty or in the provision of comforts for their patrons. None of our theatres compares, in architectural elegance, with the better class of our churches and public libraries, as very few theatre architects rise sufficiently high above the commonplaces of life to contemplate seriously the necessity of artistic design in a theatre. The general demand appears to be for lavish and hideous ornamentation.

No Rules for Designing.

There are no definite rules or principles of design that may be laid down for planning a theatre. It should be the aim of the architect to execute a design that will have an after-influence on theatre architecture, because from the standpoint of the effect upon public taste there is no other type of structure in which good designing is so essential as it is in the theatre. There are very few playhouses in America today that will serve as examples of theatre architecture worthy of perpetuation.

Although England has furnished the pattern from which most of our theatres have been copied she has supplied few ideas that are either new or original. She has furnished several good theatre planners, but they have only catered to the traditional instincts of the British people who, above all things, always demand comfort.

France and Italy, also, have failed to furnish theatre architects of authority or originality. While it is true that there are in both of these Latin countries theatres in whose auditoriums the decorative treatment is wonderfully beautiful, this beauty, however, is confined principally to the ceilings, many of which are ornate masterpieces of unique design.

Superiority of German Theatres.

It has remained for German-speaking countries to show superiority in theatre designing. It is in the departmentization and equipment of a theatre that these countries excel. The German theatre furnishes superior comfort and convenience for its patrons, as well as for its actors and employes. Special boxes with private stairways and entrances from the carriage concourse are provided for royalty and distinguished guests. While this may be a feature unnecessary in a democratic country like America, still other advantages there provided, such as commodious foyers, fine restaurants, spacious parlors and retiring rooms, with ample cloakrooms, and even a well-equipped hospital for first aid, would surely appeal to the American playgoer. In the stage

section there are studios for designers, sculptors and scenic artists; workrooms for the carpenter, decorator, locksmith and blacksmith; and huge storerooms for scenery and properties, while in America, theatres are considered complete that have scene docks, storage rooms for properties and a workroom for the electrician and stage carpenter. The actors' quarters of a German theatre have well-equipped lounging and lunch rooms. Many of the dressing rooms are supplied with baths and showers, with separate sections for men, women and children. There are assembly rooms for the chorus and ballet and special hair dressers and costumers for each. Even a storage room is provided for the actors' bicycles, an unnecessary provision in this country, where most of the actors and actresses come to the theatre in their private automobiles.

In the administration departments of these same theatres there are separate rooms for department heads and a cashier's office equipped with a payroom and vault. The musicians have a lounging room and storage space for their instruments. The firemen, too, have quarters of their own, furnished with sleeping accommodations so that firemen may always remain on the premises, and better safeguard the property from fire.

Few Comfortable Theatres in America.

Contrary to popular belief, the United States is poorly provided with superior and comfortable theatres. There are plenty of large theatres in America; many too large. But there are very few

that are either strictly modern or comfortable, and hardly any that by their exterior design indicate the character of the performance within their walls, although it is a cardinal principle of architecture that the exposed façade shall be a visible expression of what is inside.

The Theatre Is an Investment.

The greediness of American managers has done much to retard advancement in theatre designing. Theatres in America, like their English prototypes, are primarily commercial undertakings, and consequently financial interests dominate them. The owner of a theatre, when not undertaking the production of the entertainment himself, is usually able with a little discrimination to select a lessee fully capable of bringing him a proper return from his investment. The idea of promoting dramatic art never enters his mind.

Although private theatres in Europe are sometimes aided by subsidy, theatres in America are invariably erected as private moneymaking enterprises, and very good investments they are as a rule. The writer has never heard of a well located theatre of the first or second class in this country, no matter how old, that has been without a paying tenant for three consecutive months. Still, he believes that if these same theatres were modernized and a higher ideal expressed in their design their rental value would be enhanced.

Architects too often take up theatre designing without regard to the intent or purpose of the venture; the consideration of dramatic art never

affects them. It seems that many of those now engaged in designing theatres are at best merely good planners, good constructors or good business men.

The chief qualification demanded of them by equally inefficient managers or owners is the ability to construct theatres for a maximum audience at a minimum outlay, providing just enough comfort to insure public toleration. Such considerations as ample seating space, accessible toilets, sufficient coat-hanging accommodation, all of which are most necessary comforts, are stinted or sacrificed to satisfy the managerial demand for more seats.

A Helpful Advisory Board.

In designing theatres they should be adequately adapted to distinctive productions. So long as the present competition and strife between theatrical syndicates and managers persists the public will never enjoy the privileges of knowing beforehand just what sort of amusement to expect at any particular theatre. An ideal step would be the creation, by legal enactment or mutual agreement, of an advisory board, to determine in advance the theatre best suited to the requirements of each individual play. Then theatres might be better planned to meet the needs of special types of entertainment, and the section behind the curtain line could be properly proportioned and equipped for that kind of performance. Such an arrangement would create an incentive for designing the theatre exterior in a

manner to suggest, at least, the form of entertainment housed therein.

The salient points of theatre designing cannot be mastered by even the most competent architect who is not a theatre specialist, through the aid of ordinary architectural or engineering books, although this may be the case with other types of buildings. The architect should not be one who has built one or two theatres in his life time, but must be a specialist whose practice and energy has been devoted to designing theatres, and to whom the problem has become a perfectly clear and definite task, which will enable him to summarize the practicality of the type to be designed, the chief legislative requirements and the economic possibilities of the venture. Correct theatre designing depends largely upon careful study and systematic correction of the faults in preceding theatre structures, and therefore is a subject requiring an intimate knowledge of theatre construction.

The Need of Specialists.

Most of the theatre deficiencies in this country are the result of a woeful lack of qualified specialists in this line of work. Specialization is as needful in theatre architecture as in other branches of industry. It brings with it an expert knowledge of conditions and details that may always be employed to the owner's advantage. The need of specialists has been convincingly demonstrated by the unfortunate experience of a highly reputable firm of architects who were commissioned

by a group of multi-millionaires to build the Century Theatre in New York City, and to spare no expense to make it a success. Although millions had been spent in its erection the theatre was a failure, largely through the firm's inexperience in theatre construction. A futile attempt had been made, probably at the demand of the promoters, to build it large enough to house properly all classes of productions, from grand opera to light comedy. The result was an auditorium of such immensity that defective sight conditions and faulty acoustics were produced. The latter defect has been corrected by an acoustic specialist, but the theatre has, nevertheless, encountered repeated failures because of its other faults, although vast sums have been often expended for extensive alterations. Now it has been again remodeled as a music hall on continental lines. The plan of this theatre is illustrated on the page preceding Chapter I as the most recent development in theatre evolution. This, however, refers to the form. Whatever its other faults, the theatre has an excellently designed auditorium.

Size and Scale.

After the site has been selected, the first consideration in laying out a theatre is that of size and scale, and this is a matter too often slighted in theatre planning. These are subjects that call for the utmost attention, not only from the architect, but from the owner as well.

The requirements for grand opera and dra-

matic productions are very dissimilar. The opera house for grand opera (not under consideration in this treatise) requires a special form of building to accommodate the necessary tiers of private boxes and to furnish special acoustic properties for singing. A spectacular or large musical attraction also demands a building different in size and proportion from one devoted to light drama, comedy or farce. Aside from the relative proportions of the various types, the necessary differences in stage equipment must be considered. The spectacular and large musical shows require an ample audience hall and an equally large or larger stage, especially equipped for each kind of performance, while light drama, comedy or farce demands a smaller or more evenly proportioned stage, not so elaborately equipped. The motion picture house necessitates still another form which will be considered in a later chapter, devoted to the motion picture theatre.

No "Fussiness" in Design.

In connection with the size and the relative proportions of the various departments, the architectural treatment of the building must be considered. There should be no "fussiness" about a theatre design. All unnecessary ornament should be avoided, as tending to distract attention from the central or dominating motive, and every other feature should be likewise subordinated. When a single architectural idea is well expressed, the result is always simple and good.

The exterior, while it should be inviting to the

spectator, must be designed with sobriety and offer an outward appeal to the eye reflecting the ideals housed within. It should never excite expectations that are to be dispelled by a display of cramped meanness in the interior. If the theatre is to be devoted to spectacles or exhibitions on a grand scale, or designed for popular patronage at low prices, it should be impressive in style and massive in its proportions. If it be designed for light drama, comedy or farce, its design should be smaller and more intimate in character. If it is to be used for melodrama or musical shows, it should be constructed of medium size, with every evidence of refinement and comfort. In each instance great care should be exercised to proportion correctly the different departments.

Design of Exterior.

Whatever the size or character of the theatre, it should be suited in every respect to the reception and comfort of its patrons. The element of safety is the most important in theatre construction. The building, together with its contents, should be practically fireproof, and the public must be carefully guarded against danger from fire or panics occasioned by alarms of fire. If it be possible to convey an impression of security by structural appearance, so much the better. Problems of construction, fireproofing, electricity, plumbing, heating and ventilation are not different in a theatre than in any other building. The consideration of comfort, also, is essential. Both safety and comfort are treated separately

Safety and Comfort.

in later chapters. The question of acoustics, too, always a serious one in designing theatres for the spoken drama, will be taken up independently in a special chapter devoted to that subject.

AUDITORIUM

Proportions of the Theatre.

The design of the auditorium is a prime consideration in theatre planning. Its formation and decoration should tend to focus attention upon the scene pictured on the stage. The one proportion that regulates the dimensions of an auditorium is the width of the proscenium opening, or vice versa. The width of the opening should be slightly more than half the width of the audience hall. An audience hall forty feet wide should have an opening of about twenty-one feet; a sixty-foot width of hall should have an opening of about thirty-two feet, and an eighty-foot hall an opening of forty-three feet.

The height of the opening should be about equal to three-fourths of its width and the angle of the opening itself about 45 degrees. While a proscenium opening with a greater height than width might present to some eyes a better architectural effect, the reverse proportion is more practicable and in the writer's opinion more artistic.

Proscenium Opening.

The manner in which the stage opening is framed usually determines the architectural treatment of the auditorium. Where the top of the opening is arched the ceiling of the room

should be curved to correspond. If it be flat the ceiling should be formed flat. An opening with a flattened elliptical top presents the best appearance and suggests a simple, effective design for the ceiling. With amply and properly curved coves for reflected indirect lighting, and with a well-devised central open dome for ventilation that can be opened to the sky in the warm summer months, such a ceiling is ideal. The space immediately above the proscenium opening, usually termed the sounding board, should be low and curved outward to reflect better both sound and heat.

There is no part of a theatre, within or without (not even the auditorium in which the old-fashioned style of defacing its walls with meaningless and inartistic plaster wreaths and ribbons still persists), that is so commonly overloaded with meaningless ornamentation as the proscenium opening. This frame, being the constructive feature closest to the action on the stage, has greater possibilities than any other place for distracting attention from that action. It should, like the auditorium itself, be as simple, harmonious and unobtrusive as possible.

Shape of the Auditorium.

The shape of the auditorium is at present undergoing many changes. The old-fashioned rectangular type of audience hall, with a lyre or horseshoe shaped balcony, has been superseded by the square auditorium with contracting paneled walls approaching the stage opening, curved rear

walls with well rounded corners, and a balcony whose front follows the seat line below. In advanced theatres, stage boxes are eliminated for acoustic reasons, and to direct concentrated attention upon the stage. In a truly democratic country it is assuredly not necessary to provide conspicuous boxes for persons of superior rank or social distinction.

It is possible, however, that this square-shaped auditorium may not long endure, as there is already a tendency in Continental Europe toward the adoption of the fan-shaped form employed in the Wagner Opera House at Bayreuth, pictured on Page 21. This is a model affording the best sight lines and the safest means of escape in case of danger.

The decoration of the auditorium should be chaste in its simplicity and subtle in the harmony of its coloring. Such effects are more conducive to a sense of contemplation than riots of meaningless ornament and brilliant coloring. The aim should be to foster a spiritual mood and to render the senses more susceptible to favorable impression.

Sight Lines. One of the most important requisites in designing an auditorium is the establishment of correct sight lines. As no two theatres are exactly alike the sight lines for each building must be worked out separately. This, however, is a comparatively simple operation.

Theoretically the spectators in the last row of

seats underneath the balcony should be able to see the top of the proscenium opening, and the angle of vision should never exceed 45 degrees. Errors in sight lines are one of the commonest mistakes in theatre construction. A recently built theatre in New York City, publicly proclaimed a wonderful theatre, shows the result of this miscalculation. The mistake was discovered as the theatre was about to be opened, and an effort was made to correct it by lowering the main floor, a procedure that naturally had to be abandoned, as it meant the alteration and destruction of correct sight lines from the already constructed balcony.

Angle of Vision.

The first necessary step toward fixing sight lines is to establish a proper slope for the main floor. This pitch may depend somewhat upon local conditions. If the natural grade be lower at the stage end of the auditorium and slope upward toward the main entrances to a point equal with, or two or three steps above the sidewalk level, the problem is partly solved. Otherwise it may be necessary to reverse the slope of the auditorium or raise the corridor entrance considerably above the ground level.

If possible a proper slope must be given to the main floor without the necessity of risers by an incline made in the shape of a parabolic curve, as indicated by the diagrams on Page 68. The incline of the first few rows need not be great, as the eyes of the persons in these rows are about

Slope of Main Floor.

level with the stage floor, but it should increase perceptibly from about the fourth to the last row, and be so adjusted that each spectator can easily see over the head of the person in front of him. The old fashioned saucer-shaped main floor, with its seats curving upward on either side, had its commendable points. However, the building laws in many cities regulate the pitch of theatre floors.

With the incline of the main floor established, experimental sectional lines to determine the balcony slope and the various sight lines should be drawn on the section of the plans, as follows:

From a point corresponding to the position of the eye of a person seated in the last row of seats (about three feet above the floor level) draw a vision line underneath the balcony to the top of the proscenium opening. This vision line fixes the lowest possible vertical position of the underside of the balcony.

Balcony Risers.

A line drawn from the base of the stage at the intersection of the curtain line and main floor level through the top of the first riser to the top of the rear balcony riser will determine the various heights of intermediate risers.

Then draw two vision lines from the eye points of persons seated in the first and last rows of the balcony (about three feet above the floor level) to a common point well below the front line of the stage. This will establish the balcony sight lines.

If the balcony be a wide one with curved sides,

additional sight lines should be drawn on both sides, and from underneath the balcony on each side as well, to fix the sight lines at these points. These additional lines may make it necessary to lower the balcony sides a trifle with a downward curve. **Sight-Lines with Wide Balconies.**

Should the sight lines not prove satisfactory, a minor change in the slope of the main floor or the elimination of a single row of seats from the balcony will cause a considerable improvement. The correct pitch for a balcony should never be over fifteen and a half inches for each riser, or two steps of seven and three-fourths inches each.

In designing stairways leading to balconies due regard must be given to employing the fewest possible number of steps, and where possible, the steps should be arranged between landing platforms in groups of not more than a dozen continuous steps. If the balcony be a high one, there should be an intermediate mezzanine floor, with a broken pair of stairs on each side of the house, and continuous broken flights extending from this floor to the rear level of the balcony. The principal stairways from the different parts of the house should lead direct to the foyer or lobby, with runs that turn in one direction only. For an example of ingenious stairways see illustration at the end of this chapter. **Stairways.**

From the mezzanine floor, pierce the balcony with entrance tunnels on each side of the house to the cross passage in the rear of the front tier **Balcony Entrance Tunnels.**

of balcony loggias. If the balcony be very wide construct in addition intermediate tunnels. Cloakrooms and administration offices may also be placed on this mezzanine floor, which should be cut out and designed like a balcony for the foyer below.

The Cantilever Principle.

There should be no exposed posts to hold up the balcony. It should be supported on the cantilever principle, either with or without cross trusses resting on columns imbedded in the walls. Sometimes it is possible to inclose a series of two-inch or three-inch Lally columns in the partitions between the boxes as additional support.

The seating conditions will be discussed separately in the chapter devoted to "Comfort."

Orchestra Well.

It is highly important that the lines encompassing the orchestra well should be so arranged as to insure good acoustics and at the same time conceal all view of the musicians from the audience. There is nothing more disturbing in a theatre than the heads of musicians bobbing into view above the orchestra rail during a performance. Soft strains of hidden music will give the effect of coming from a distance, and are far preferable to the blatant blasts of an exposed brass band.

It is also of advantage to have a suitable sound-space underneath the orchestra well, and, if possible, surrounding it. The Court Theatre at Wiesbaden, Germany, has an arrangement whereby divisional platform sections of the orchestra well are mounted on hydraulic lifts, which may be ele-

vated to suitable heights or even to the level of the auditorium floor if desired.

The orchestra well of the famous Wagner Opera House at Bayreuth, a diagram of which is shown on Page 133, embodies an excellent arrangement for an orchestra well. Supplemented with hydraulic lifts and a sounding space, such an orchestra well would be ideal.

COMMUNICATION.

The communication of a theatre has reference to the vestibule, foyer, aisles, exits and stairways that intercommunicate between the various sections of the playhouse.

Vestibule. The first section of communication is the vestibule or outer lobby, which should offer every facility for the entrance of the patrons. It should never show the same warmth of decoration as the better parts of the house, but it should be a simply treated, inviting approach to the auditorium. Its size should be such as to prevent any possibility of congestion, even in time of panic, but it should not be so large as to waste space that might be put to better use.

Box Office. The location of the box office and a local manager's office within it is largely a matter of convenience. There should, however, be two ticket windows in the box office, separated from one another by space sufficient to permit the sale of tickets for the present performance and those for future booking without confusion. The number

and arrangement of retiring rooms and toilets will be taken up later in the chapter devoted to "Comfort."

Foyer.

Next in order of sequence is the foyer, the drawing room of a theatre. In England the foyer partakes of the character of a "lounge," and is generously provided with comfortable settees. This is a requisite feature where the foyer also becomes the promenade.

For the sake of safety the lobby or foyer should be made common to all parts of the house. The semi-circular corridor, originally created by Gottfried Sempner, and now universally used in good theatre designing, is a true idea for a foyer.

Exits.

The playgoer instinctively prefers to leave the theatre by the way he entered it, and in time of panic will employ only the means of escape with which he is thoroughly familiar. For this reason all exits and passages of communication should be so distributed and arranged that they are in constant use by the audience. While the average playgoer may not have a keen appreciation of the architectural treatment of a theatre, a clear plan and abundant means of quick exit will surely appeal to him and do much to popularize a playhouse.

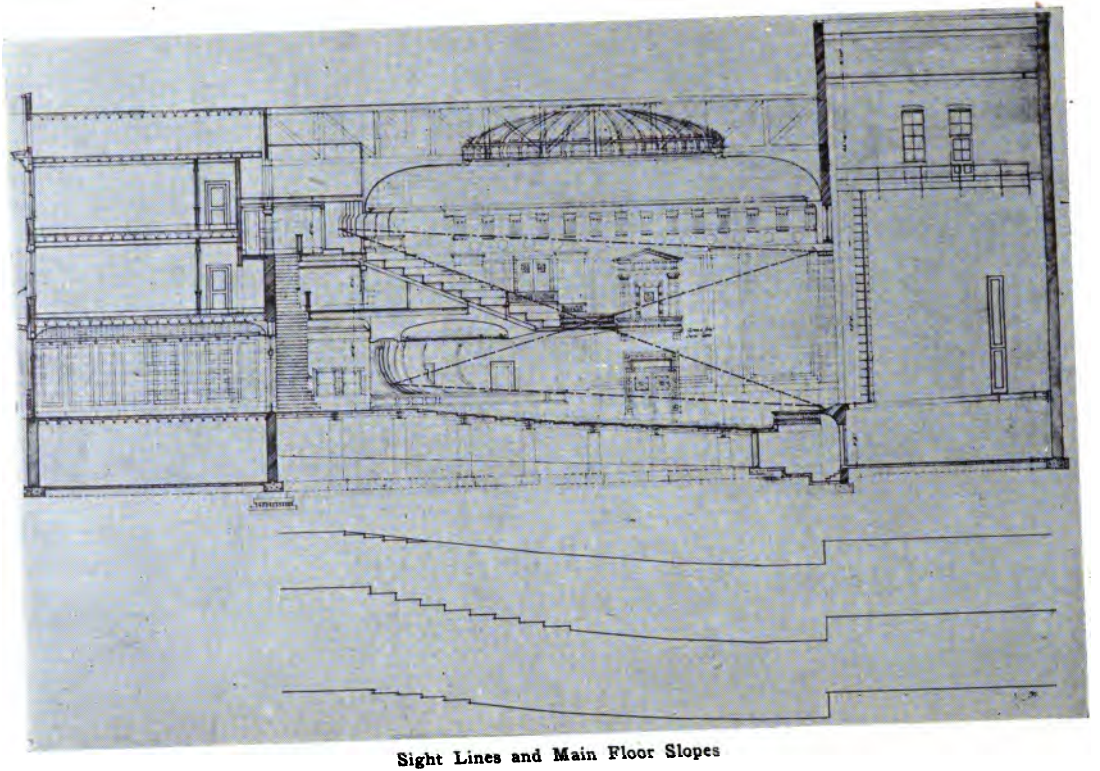
Aisles and Passages.

The seating should be arranged in continuous rows, thirty-six inches from back to back (instead of thirty-two inches, the legal distance now employed in America), with ample aisles radiating from the front of the auditorium to the rear. At

the points opposite the side entrances from the foyer widened passages between rows should be introduced, extending to the middle or intermediate aisles, as necessity may require. Where it is desirable the radiating aisles may turn at this dividing passage and extend parallel to the side walls to the rear of the auditorium; or if the cross passage be a liberal one, new aisles may be formed from it.

Fourteen Chairs the Maximum.

There should never be more than fourteen chairs between aisles in any single row, and if one end of the row be blind and without an aisle, seven chairs should be the limit.



Sight Lines and Main Floor Slopes

CHAPTER V

THE STAGE SECTION.

German Ingenuity.

SPECIAL interest has been taken in the development and equipment of the German stage. Yielding to the influence of art, Teutonic ingenuity is continually devising new mechanisms and original effects, many of which, it is true, would be impracticable in American theatres so long as profit remains the determining factor in theatre construction.

In America the relative size and equipment of the stage are usually overlooked in the mercenary anxiety to provide only for seating capacity, but the time may come when the architect will be asked by the manager or owner to enlarge the stage in correct proportion to the auditorium, in order properly to accommodate the productions that custom or public taste may demand as suitable for that theatre.

The main features of a German stage that would impress an American architect are its size, plan and mechanical contrivances, the unique devices for building up scenic effects, and the perfect lighting arrangement. The dimensions of the New Deutche Opera House stage in Charlottenburg, Berlin, are colossal. This stage measures 249 feet in width by 170 feet in depth, being the largest in the world; larger even than the immense stage of the New York Hippodrome.

The scenic contrivances and lighting arrangements of modern German theatres are little short of marvelous.

One idea only have the modern theatres of Europe adopted from America; the American level stage. The pitched stage previously employed in Europe for the better vision of the audience has been recently discarded for the artistic, constructive and technical advantages of a level stage.

A few years ago scene changes were made in all theatres during intermission, but by recent innovations that permit a prearrangement of setting to be used much time is now being saved in advanced playhouses and better effects are being obtained. These necessary devices have not yet been generally adopted in America, but the inevitable importation of large stage productions from Europe will make necessary the correction of this serious fault in American stagecraft.

Turn-Table Stage.

In 1896 Head Engineer Lautenschlager of the Residence Theatre at Munich, Germany, invented and first used the now famous revolving stage, which permits the simultaneous preparation of several scenes, each in its proper turn being presented to the audience by revolving the turn-table so that the desired scene comes into view through the proscenium opening. This device is an excellent one for use in comedies or light dramas, and has been already adopted in several American theatres.

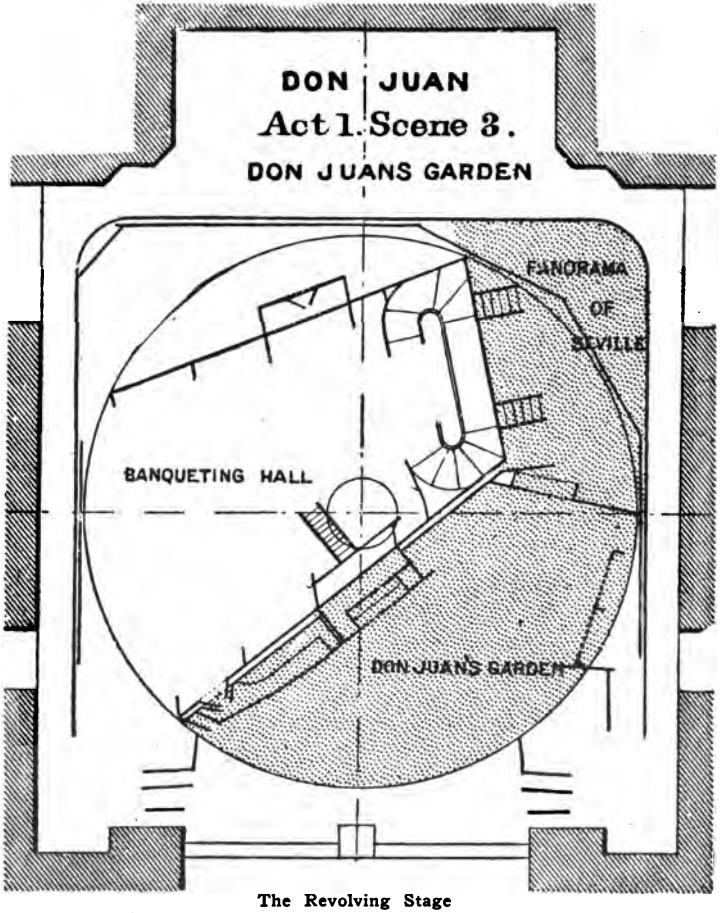
Reform Stage.

This turn-table stage, however, failed to fill the requirements of large productions, and two further general schemes were devised. In one of these there were side and rear stages consisting of huge movable platforms adjoining the slightly depressed actual playing stage. The different settings were built up on these auxiliary platforms and rolled into place, as desired, above this playing stage. This device was called the Reform Stage and was originated by Stage Director Brandt of the Berlin Court Theatre, where it was first installed.

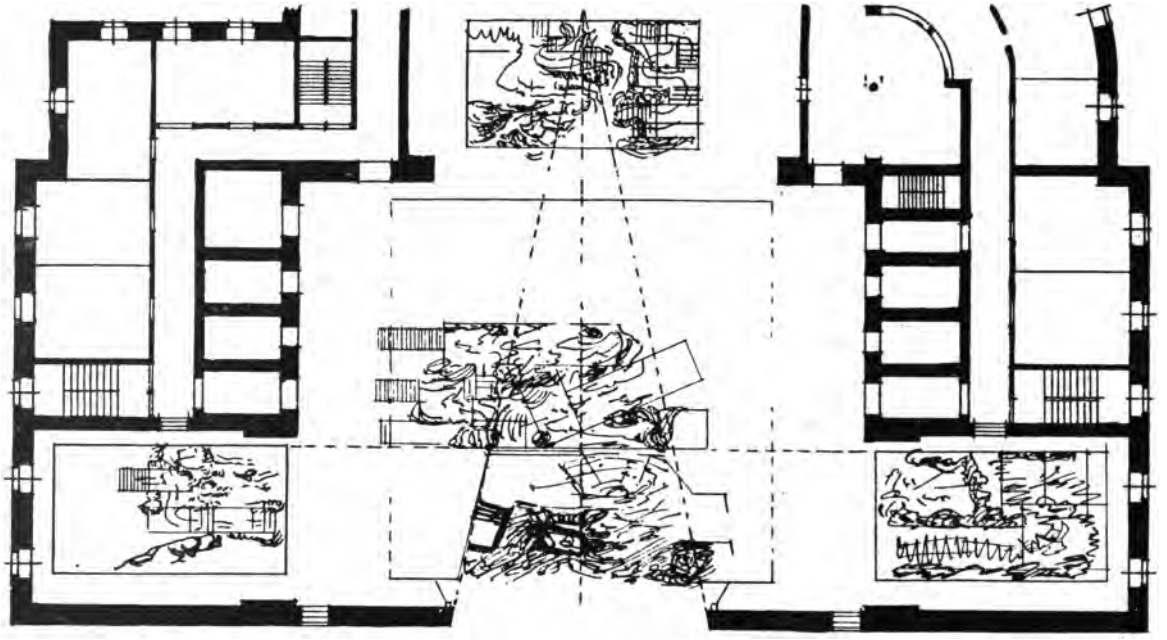
Asphalia Stage.

In the other scheme the movable portions of the stage floor were so increased that the entire working stage became a series of hydraulic-lift platforms, capable not only of being raised and lowered but also of being propelled laterally. The scenes in this system are built up in the basement underneath the stage, wheeled into the desired position, and raised to the stage level by hydraulic power. This stage was the invention of the Asphalia Company of Berlin, and has been installed in the Hofburg Theatre in Vienna and the Wiesbaden Theatre, at Wiesbaden, Germany. In both of these theatres this device is most remarkable, the working portion of the stage being divided into nine platforms mounted on hydraulic rams, which may not only descend to a sub-stage but there be interchanged.

It is in the Paris Opera House and the Deutche Opera House in Charlottenburg, Berlin, that the



The Revolving Stage



Brandt's Reform Stage with Three Movable Platforms

Reform Stage has reached its culminating perfection. Here these mammoth stages are so perfect mechanically that they may be rolled into position by one man, and frequently the scene changes are made with extreme realism in full view of the audience. For instance, when a garden scene follows an interior setting, the two are arranged in sequence and roll by as the actors are passing from the house into the garden. Originally built for hydraulic power, the first adopted substitute for hand power, these devices may now be operated by electricity.

The Horizon. While some of the newer German theatres still retain the loft space above the stage in which to hoist scenery, they have in addition a suspended horizon shaped like a quarter-sphere shell, also the invention of Herr Brandt. It curves outward at the top and sides, and upon its surface a stereopticon, mounted on a bridge above and inside the proscenium opening, projects realistic cloud effects, either stationary or moving. The new Deutche Opera House at Charlottenburg, Berlin, has this device mounted on a traveling crane, worked by electricity from a cab fixed on the traveler. The rear wall of the Dresden Theatre, too, has been built into a permanent horizon of this type, on the plan of a true ellipse, extending high above the proscenium.

There is every evidence that the extra high scene loft, which has ever been a troublesome architectural feature, may be eliminated in the

future American theatre as hanging room for scenery. The old style painted scenery with its "flats," "wings" and ugly "sky borders," is impossible for artistic use, and is gradually giving way to modern plastic scenery, built up "in the round" to indicate better the true perspective. In most fine productions actual objects are now employed on the stage in place of painted "properties."

Elimination of the Scene Loft.

The elimination of the extreme upper region of the stage and the establishment of a sky-dome would truly comport with the presentation of natural appearing plastic scenery and permit a texture of reflected light from the cupola-horizon to give the effect of infinite distance. It has been suggested by Professor Wallace C. Sabine, of Harvard University, a recognized authority on acoustics, that this quarter-sphere form of horizon is neither necessary from the standpoint of illumination nor desirable from the standpoint of acoustics. He believes that a flatter back with a sharper curvature above and at the sides would be preferable for the purposes of both acoustics and utility.

A stage innovation of the advanced theatre that may be readily adopted in American theatres with no appreciable loss of space is the inner adjustable proscenium arch. This plainly designed frame is placed four or five feet inside the permanent arch and by an ingenious arrangement is made to contract or expand to accommodate

the scene on the stage. Thus a ballroom can use the full expanse of the stage, and a bedroom a much smaller part to indicate the true size of a bedroom and thereby cause the actors' figures to appear natural in stature. This inner opening may be treated in neutral colors to harmonize both with the scene presented on the stage and the permanent decorations of the auditorium.

For the information of those who contemplate erecting theatres not intended for play productions but for the temporary housing of traveling attractions American stages are at present equipped with the scenery described in the table at the end of this chapter.

EXISTING AMERICAN STAGES.

Reduced Stage Aprons.

The American stage floor is raised about 3 feet 9 inches above the front section of the auditorium floor, so as to fix the stage level just below the eyes of the people seated in the first rows. The newer types of theatres are built with straight narrow stage projections instead of old-fashioned stage aprons. The average depth of the stage is about equal to the width of its proscenium opening. The dressing rooms are usually arranged on both sides of the stage behind fireproof walls.

American stages usually have a storage space for properties, a separate workroom for the carpenter and electrician, and occasionally a room for the costumer. Many of the larger theatres

include a scene dock for the storage of scenery that is not in use. In theatres where large spectacles are presented there are also extra lighting galleries for the installation of calcium lights. Besides doors for actors and employes a large scenery door four or five feet wide and as high as the underside of the fly gallery is installed to admit scenery carried on end. This large scene door is often made in two sections, the upper section overlapping the under one to prevent rain from beating in on the stage.

Proscenium Curtain.

The front curtain in most American theatres is arranged to rise without rolling. The writer favors a front curtain that parts in the middle and loops upward on either side as it is being hoisted to those now in general use. When the ordinary curtain is being hoisted it shows the feet of the actors first, and is therefore inelegant and inartistic, unless the performance be a burlesque show. Aside from the regular front curtain there is provided for fire safety an asbestos curtain to cover the stage opening.

Stage Proper.

The section of the stage seen through the proscenium opening is called the stage proper, and is sub-divided into three divisions; the "center of the stage," the "prompt side," and the "opposite" or "O.P. side." The entire stage mechanism is operated from the "prompt side."

Each side of the stage for its full depth is figuratively divided into "entrances," the first of which is termed the "the first prompt entrance,"

on the prompt side, and "first O.P. entrance," on the opposite side. These appellations hold good for the entire height of the stage.

The Flies. The section of the stage above the proscenium arch is termed "the flies," or fly loft. Here hang the borders, those in use being exposed, while the others are hauled out of sight by means of pulleys rigged in the loft, together with the other scenery not employed on the stage.

On both sides of this loft space are the fly galleries, which are equipped with apparatus for manipulating scenery and other devices. This fly gallery is usually constructed about forty feet in height so as to store properly all the hoisted scenery not in use, and its face should be from six to ten feet back from the sides of the proscenium opening to provide room for hanging drops or borders.

Gridiron. The gridiron is another feature of this loft space. It is an open-latticed platform consisting of slats set three or four inches apart, through which the hanging scenery may freely pass suspended on three sets of lines. If the drops be over forty-five feet in width four sets of lines are advisable The gridiron may be supported on steel girders or suspended from the roof trusses and should be strong enough to support men walking on it. Access to the fly galleries and gridiron should be by means of steel ladders or a fire-proof stairway placed in some out-of-the-way corner. A few new theatres in America

operate the scenery from the stage level, without the use of the fly galleries, and thus obviate the necessity of men working in the super-heated atmosphere of the sky loft.

SCENERY.

The scenic equipment for the usual American theatre is given in the tabulated list that follows.

Tormentors and Grand Draperies Disadvantageous.

Excluded from this list are the front pieces usually termed "the drapery," "proscenium" and "working borders" and "tormentor wings," all of which are usually out of keeping with appropriate stage scenery. The proscenium opening is intended to represent an imaginary fourth wall of the stage, through which the audience is privileged to view the performance. If the stage presents a forest scene, to preserve this illusion it should be decorated only with forest scenery; if an interior, only with scenery appropriate to such a setting. Scenery "tormentors" and "grand draperies" are foreign to nearly every scene presented on the stage and only serve to disillusion the spectator. The installation of an inner proscenium arch would effectively remedy this display of extraneous scenic drapings.

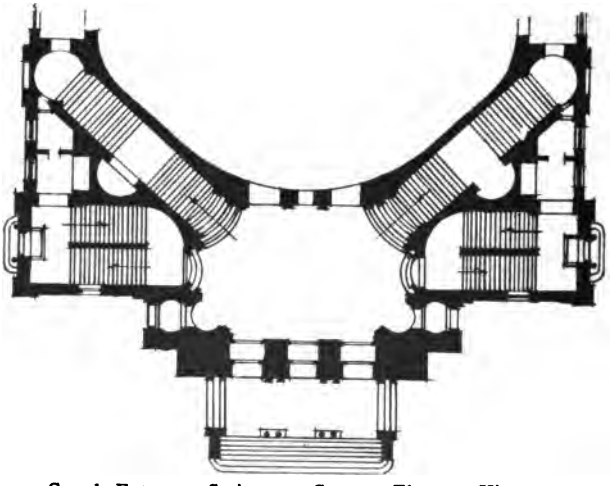
The floor of the stage is usually covered with a painted canvas ground-cloth to correspond in tone with the scene on the stage. Economy may often be effected by painting the ground-cloth a different color on each side.

The usual American stock settings are made

in from eight to sixteen pieces, according to the size of the stage to be dressed. Modern interiors are built about 16 feet high and each wing about 5 feet 9 inches wide. Profiled doors are preferably used instead of old-fashioned flapping canvas doors.

"Drops in One."

The "Drops in One," consisting of the picture sheet, conservatory, olio and street scene, are made a trifle wider than the proscenium opening. The object of "Drops in One," placed five or six feet behind the curtain line, is to allow the play to proceed without interruption in front of the drop while new scenery is being placed behind it.



Grand Entrance Stairways, German Theatre, Vienna

AVERAGE SCENERY EQUIPMENT—LOCATION AND PLACING.

Front Pieces.

Asbestos Curtain.
Act Drop Curtain.
Conservatory Drop.
Olio.
Street.

Palace Interior.

Back Drop.
Cut Drop.
Arched Borders.
Profile Wings and Flippers.
Leg Drops (instead of Borders or Wings.
Balustrades.

Light and Dark Fancy Interiors.

Center Arch Piece.
Arched Piece with Double Doors.
Bay Wing.
Door Wings.
Jogs.
Wings, including one with fireplace panel.
Set Fancy Backings.
Hanging Fancy Backing.
Borders or Ceiling.
Practical Fireplace.
Fireplace Backings.

Plain Chamber Interior.

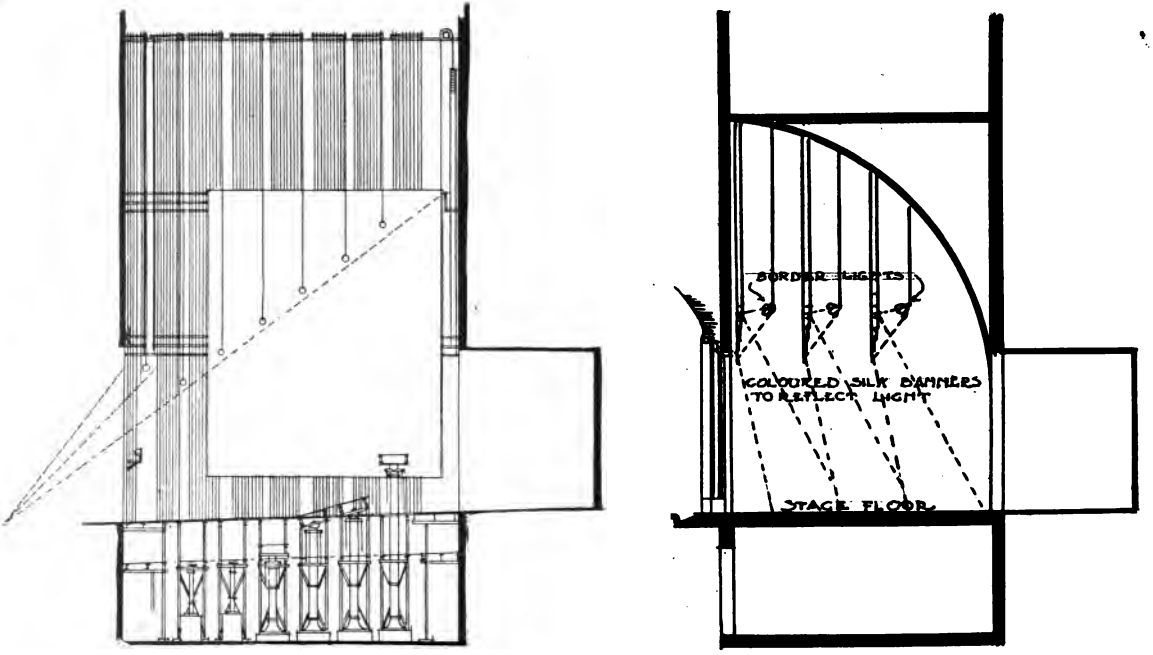
Arched Piece.
Wings, including one with fireplace panel.
Door Wings.
Window Wing.
Bay Window.
Jogs.
Set Backings.
Hanging Backing.
Borders or Ceiling.
Practical Fireplace.

Wood Interior.

Light Wood Drop.
Cut Wood Drops.
6 Profile Wood Wings with Flippers.
3 Foliage Borders.
Foliage Leg Drops.
Set House (with practical door and window).
Porch.
Platform and Steps.
Rustic Cottage.
Cut Tree Tap.
Profile Set Tree.
Garden Drop.
Profile Statues.
Profile Vases.
Rocky Pass Drop.
Horizon Drop.

Kitchen Interior.

Window Wings.
Window Pieces.
Door Wings.
Wings, including one with fireplace panels.
Jogs.
Set Kitchen Backings.
Borders.
Practical Fireplace.
Prison Interior painted on back Kitchen interior.



Asphalia Stage (Left), Fortuny System Indirect Lighting (Right)

CHAPTER VI.

LIGHTING.

Concealed Indirect Lighting.

A HIGH standard of excellence has been reached in theatre lighting throughout the world, but German progress in this field has been equal to Teutonic proficiency in other phases of theatre construction. It is now possible by the aid of large tubular incandescent lamps imported from Europe to illuminate effectively a theatre auditorium by reflected light in such a manner that the source of illumination is unnoticeable. These tubes are made several inches in diameter so as to avoid overheating, and are about twelve inches in length, with half their interior diameter silvered on the inside to serve as reflectors.

This inside silvering prevents any accumulation of dust on the reflector surface, and if these lights are installed closely together behind the lower cornice of a well rounded ceiling cove, the lights diffuse a continuous soft, warm glow, entirely free from the spotty effects produced by common incandescent bulbs. To the ordinary observer the source of light is completely hidden, for nothing is visible but a continuously illuminated cove that might be mistaken for brilliant decoration. With a regulation "dimmer" apparatus these self-reflecting tubes give any desired degree of illumination.

There is no good reason why this same concealed lighting effect should not be carried out in all the public departments of the theatre, thereby lessening the cost of fixtures. Exposed fixtures, even the so-called indirect sort, are an unsightly nuisance and they gather dust, which gives off an offensive odor when heated. Reflected light introduces no shadows and presents a far more artistic and restful effect than glaring lights of any kind.

Light Under the Balcony

The space underneath the balcony could be illuminated by reflected light through flush, translucent glass panels, thus avoiding exposed fixtures. The Rialto Theatre in New York, a palatial picture house recently opened, has a similar effect arranged in a most pleasing manner. The lights are automatically changed at timed intervals from pale blue to soft rose and vice versa. This automatic change of light easily may be introduced throughout the auditorium by the installation of parallel rows of differently colored tubes.

Illuminated Balcony Steps.

Reflected lights, red or green, showing through flush glass panels set in the risers of all balcony aisle steps, should be introduced in every theatre to prevent patrons from stumbling in the dark.

Vacant Seats Lighted.

Another useful innovation that might be employed in motion picture theatres is the installation of tiny red or green bulbs, mortised in the top of the chair backs, which are lighted by the tipping of the empty seat and thereby indicate to the ushers vacant chairs.

EXTERIOR LIGHTING.

There are so many modes of exterior lighting and so many new devices constantly being introduced that one hesitates to recommend any particular kind. Here, too, the writer, a confirmed antagonist to glaring lights, would suggest some form of indirect lighting. This should be either by simple reflection or by brilliant reflection through colored, translucent or cathedral glass, for even the outline of lighted bulbs showing through the glass is inartistic. A brightly illuminated window extending the entire height between pilasters situated on either side of the entrance, and lighted by reflected light through colored glass, would be an effective beacon for a picture theatre.

STAGE LIGHTING.

Location of Switchboard.

Great advancement has also been made in the methods and principles of stage lighting. Even the location of the operator regulating the stage lighting has been changed in the advanced European theatres. In these theatres the light switchboard is underneath the stage apron, adjacent to the orchestra well. From that point the operator, by lifting a small trap similar to the old-fashioned prompter's traps, may view perfectly his light effects and control them.

Storage Lighting.

Many theatres depend for their lighting upon storage batteries, because a steadier light and more realistic effects may be obtained in this man-

ner. These, however, are generally used only in ordinary theatres for reserve or emergency purposes.

Fortuny System.

An Italian painter named Fortuny has invented a system of indirect stage lighting that has met with such success that it probably will be universally adopted. In this system the light is furnished by powerful lamps, stationed on the reverse side of the hanging borders, and reflected from variously colored silk banners, whose position is changeable, placed behind these borders. These indirect rays give a fuller and softer light and have the advantage successfully of dissolving or mixing colors. This device is also employed to illuminate without shadows the canopied horizon, to which allusion has already been made. This innovation provides atmospheric enveloping light, as contrasted with the old-fashioned direct light that struck objects on the stage and projected their shadows beyond.

Footlights Abandoned.

There can also be no doubt that illumination mainly by footlights is a passing phase in the advanced theatre. Where footlights exist it is better to arrange three horizontal continuous rows of tubular incandescent lamps of red, white and blue, similar to those described for auditorium cove lighting, than to employ the ordinary tricolored incandescent bulbs in common use.

The method of projecting light from above, and from reflected side-lights, is now used in advanced theatres to replace the glaring footlights.

In the same manner, stereopticons are employed to introduce storm or cloud effects on the canopied horizon, with realistic lightning flashes if desired.

In most American theatres 40-watt lamps are used for footlights, arranged with eight lamps to the foot, and colored red, white and blue in regular sequences of these colors, to produce single or combination effects. The footlight trough should be from two to three feet wide, and the exposed surface should be painted a dull black or dark green, so as not to reflect the glare of the footlights up into the balcony.

Border Lights.

Each theatre in America also has about six rows of border lights, encased in reversed galvanized iron troughs suspended by extension chains, and set six or seven feet apart. The border lights for illuminating the stage should be at least two feet longer than the proscenium opening, the first row being about two feet shorter than that opening. Border lights are also arranged in three colors.

Every stage should be provided with incandescent stage sockets in each entrance, right and left, and with several conveniently distributed arc pockets. There should also be a sufficient supply of bunch-lights and strip-lights, with connections, all arranged with interchangeable sockets for the introduction of colored bulbs.

For the sake of increased protection from fire it is better to install all electric wiring according to the code prescribed by the National Board of

Fire Underwriters, useful extracts from which are here included:

NATIONAL BOARD OF FIRE UNDERWRITERS ELECTRIC CODE.

All wiring, apparatus, etc., not specifically covered by special rules herein given must conform to the standard rules and requirements of the National Electrical Code, and the term "Theatre" shall mean a building or that part of a building regularly or frequently used for dramatic, operatic, moving picture or other performances or shows, or which has a stage for such performances used with scenery or other stage appliances.

Service. Where supply may be obtained from two separate street mains, two separate and distinct services must be installed, one service to be of sufficient capacity to supply current for the entire equipment of theatre, while the other service must be at least of sufficient capacity to supply current for all emergency lights, where supply feed for emergency lights must be taken from a point on the street side of main service fuses. By "emergency lights" are meant exit lights and all lights in lobbies, stairways, corridors and other portions of theatres to which the public have access, which are normally kept lighted during the performance.

Where source of supply is an isolated plant within the building, an auxiliary service of at least sufficient capacity to supply all emergency lights must be installed from some outside source, or a suitable storage battery within the premises may be considered the equivalent of such service.

Stage. All permanent construction on stage side of proscenium wall, except as hereinafter provided, must be approved conduit or armored cable.

Footlights. Must be wired in approved conduit or armored cable, each lamp receptacle being inclosed with an approved outlet box, or the lamp receptacles may be mounted in an iron or steel box, metal to be of a thickness not less than No. 20 U.S. sheet metal gauge, treated to prevent oxidization, so constructed as to inclose all the wires. Wires to be soldered to lugs of receptacles.

Must be so wired that no set of lamps requiring more than 1,320 watts nor more than 24 receptacles shall be dependent upon one cut-out.

Borders and Proscenium Lights.

1. Must be constructed of steel to a thickness not less than No. 20 U.S. sheet metal gauge, treated to prevent oxidization, be suitably stayed and supported, and so designed that flanges of reflectors will protect lamps.

2. Must be so wired that no set of lamps requiring more than 1,320 watts nor more than 24 receptacles shall be dependent upon one cut-out.

3. Must be wired in approved conduit or armored cable, each lamp receptacle to be inclosed within an approved outlet box, or the lamp receptacle may be mounted in an iron or steel box, metal to be of a thickness not less than No. 20 U.S. sheet metal gauge, treated to prevent oxidization. so constructed as to inclose all wires. Wires to be soldered to lugs of receptacles.

4. Must be provided with suitable guards to prevent scenery or other combustible material coming in contact with lamps.

5. Cables for borders must be of approved type and suitably supported; conduit construction must be used from switchboard to point where cables must be flexible to permit of the raising and lowering of border.

6. For the wiring of the border proper wire with approved slow-burning insulation must be used.

7. Borders must be suitably suspended, and if a wire rope is used same must be insulated by at least one strain insulator inserted at the border.

Stage and Gallery Pockets.

Must be of approved type, controlled from switchboard, each receptacle to be of not less than 35-ampere rating for arc lamps nor 15-ampere rating for incandescent lamps and each receptacle to be wired to its full capacity. Arc pockets to be wired with wire not smaller than No. 6 B. & S. gauge and incandescent pockets with not less than No. 12 B. & S. gauge.

Plugs for arcs and incandescent pockets must not be interchangeable.

Scene Docks.

Where lamps are installed in scene docks they must be so located and installed that they will not be liable to mechanical injury.

Curtain Motors.

Must be of ironclad type and installed so as to conform to the requirements of the National Electrical Code.

Control for Stage Flues.

In cases where dampers are released by an electric device, the electric circuit operating same must be normally closed.

Magnet operating damper must be wound to take full voltage of circuit by which it is supplied, using no resistance device, and must not heat more than normal for apparatus of similar construction. It must be located in the loft above the scenery, and be installed in a suitable iron box with a tight, self-closing door.

Such dampers must be controlled by at least two standard, single pole switches mounted within approved iron boxes provided with self-closing doors without lock or latch, and located, one at the electrician's station and others as designated by the inspection department having jurisdiction.

Dressing Rooms.

Must be wired in approved conduit or armored cable. All pendent lights must be equipped with approved reinforced cord, armored cable or steel armored flexible cord.

All lamps must be provided with approved guards.

Portable Equipment.

Arc lamps used for stage effects must conform to the following requirements:

1. Must be constructed entirely of metal except where the use of approved insulating material is necessary.

2. Must be substantially constructed, and so designed as to provide for proper ventilation, and to prevent sparks being emitted from lamps when same are in operation, and mica must be used for frame insulation.

3. Front opening must be provided with a self-closing hinged door frame, in which wire gauze or glass must be inserted, except in the case of lens lamps, where the front may be stationary, and a solid door be provided on back or side.

4. Must be so constructed that neither carbons nor live parts will be brought into contact with metal of hood during operation, and arc lamp frames and standards must be so installed and protected as to prevent the liability of their being grounded.

5. Switch on standard must be so constructed that accidental contact with any live portion of same will be impossible.

6. All stranded connections in lamp and at switch and rheostats must be provided with approved lugs.

7. Rheostats must be plainly marked with their rated

capacity in volts and amperes, and, if mounted on standard, must be raised to a height of at least 3 inches above floor. Resistance must be inclosed in a substantial and properly ventilated metal case which affords a clearance of at least 1 inch between case and resistance element.

8. A competent operator must be in charge of each arc lamp, except that one operator may have charge of two lamps when they are not more than 10 feet apart, and are so located that he can properly watch and care for both lamps.

Bunches.

Must be substantially constructed of metal and must not contain any exposed wiring.

The cable feeding same must be bushed in an approved manner where passing through the metal, and must be properly secured to prevent any mechanical strain from coming on the connection.

Strips.

Must be constructed of steel of a thickness not less than No. 20 U.S. sheet metal gauge, treated to prevent oxidization, and suitably stayed and supported and so designed that flanges will protect lamps.

Cable must be bushed in a suitable manner where passing through the metal, and must be properly secured to prevent serious mechanical strain from coming on the connections.

Must be wired in approved conduit or armored cable, each lamp receptacle being inclosed within an approved outlet box, or the lamp receptacle may be mounted in an iron or steel box, metal to be of a thickness not less than No. 20 U.S. sheet metal gauge, treated to prevent oxidization, so constructed as to inclose all wires. Wires to be soldered to lugs of receptacles.

Portable Plugging Boxes.

Must be constructed so that no current carrying part will be exposed and each receptacle must be protected by approved fuses mounted on slate or marble bases and inclosed in a fire-proof cabinet equipped with self-closing doors. Each receptacle must be constructed to carry 30 amperes without undue heating, and the bus-bars must have a carrying capacity equivalent to the current required for the total number of receptacles, and approved lugs must be provided for the connection of the master cable.

Pin Plug Conductors.

Must be of an approved type, so installed that the "female" part of plug will be on live end of cable, and must be so constructed that tension on the cable will not cause serious mechanical strain on the connections.

Portable Conductors. Flexible conductors used from receptacles to arc lamps, bunches and other portable equipments must be approved stage cable except that for the purpose of feeding a stand lamp under conditions where conductors are not liable to severe mechanical injury an approved reinforced cord may be used, provided cut-out designed to protect same is not fused over six amperes capacity.

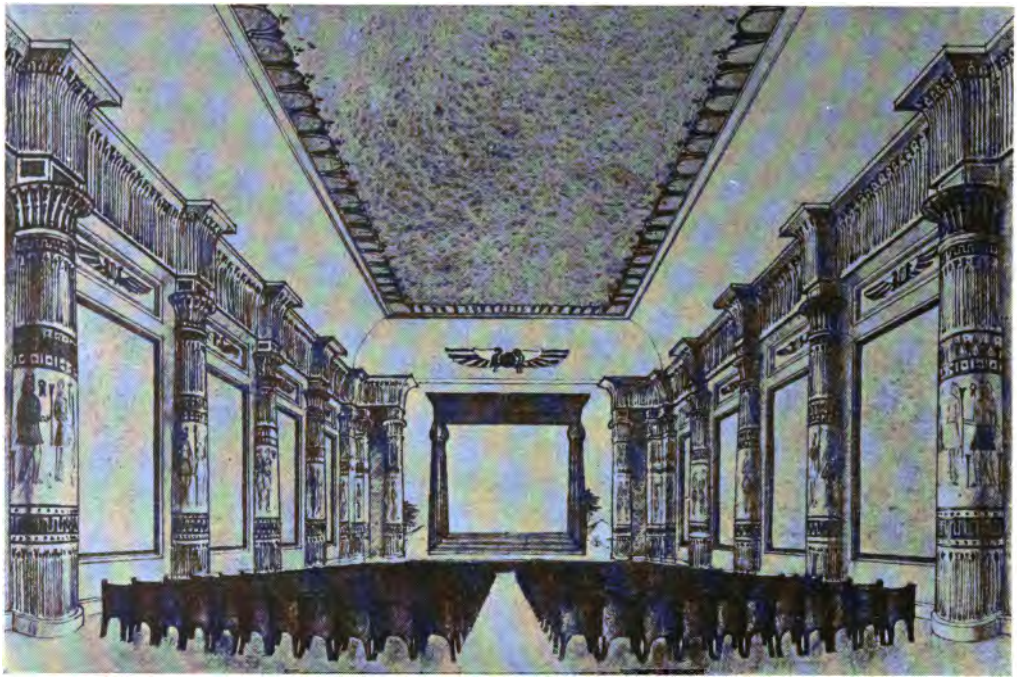
Scenery Lights. Where brackets are used they must be wired entirely on the inside, fixture stem must come through the back of the scenery, and end of stem be properly bushed.

Festooned Lights. Wiring of same must be of approved type, joints to be properly made, soldered and taped, and staggered where practicable.

Where lamps are used in lanterns or similar devices, approved guards must be employed.

Electrical Effects. Where devices are used for producing special effects such as lightning, waterfalls, etc., the apparatus must be so constructed and located that flames, sparks, etc., resulting from the operation cannot come in contact with combustible material.

Interior View of Rialto Theatre, New York City



Model Small Photoplayhouse, Egyptian Design

CHAPTER VII

MOTION PICTURE THEATRES

THE most recently developed phase of the theatres is the photoplayhouse, devoted to the silent drama. Enthusiasts claim that the daily attendance at these theatres is ten millions of people. Sceptics believe that not more than three millions form the daily attendance, but whether the disputed daily attendance be ten per cent of the total population of the United States or only three and one-third per cent, its influence as a social factor and a popular form of entertainment is most potent.

Growth of Motion Picture Theatres.

The remarkable growth of the motion picture theatre in the last fifteen years and its constantly increasing popularity have caused many changes in the business of the regular theatre. The aim of the photoplayhouse is to present motion pictures in an attractive manner to a discriminating public, and the better to serve this purpose countless numbers of old theatres have been remodeled and many buildings erected.

European countries—countries in Asia, Africa, Australia, South America, Canada and Mexico, too, are seized with this same popular fever for the cinema. Universal success has crowned the photo stage. England, Germany and Russia occasionally surpass America in the construction of their cinematograph theatres, not in size per-

haps, but in their superior appointments and better arrangements for comfort.

An Ingenious Plan.

An enterprising Russian exhibitor named Khanjonkoff, anxious to increase the seating capacity of a photoplayhouse he was erecting in a thickly populated section of Moscow, devised an ingenious plan of auditorium, combining three floors facing one screen. He constructed the house with a pit floor in the basement beneath the street for the cheaper patrons. On this floor he placed a large orchestra well directly in front of the screen, with the vacant space above it extending upward past the main floor and balcony.

This arrangement permitted the utilization of nearly the entire depth of each floor for seating. The seats on the basement floor began at the edge of the orchestra well and extended back to the rear wall with a slightly downward pitch; these patrons being compelled to look upward to view the screen. The main floor over it began at a point just above the fifth row in the pit, and inclined upward with the usual ground floor slope as it receded to the rear wall. The seats on this floor were arranged in the usual manner. The balcony above the main floor began at a point about five rows back from the beginning point of the main floor, and ascended with the customary balcony risers to the rear of the theatre.

The Design and Plan.

The designing of photoplayhouses in America is yet in an experimental stage. Few architects understand or attempt to learn the requirements

of this special type of building. The first problem to be solved when planning a theatre of this class is its size in relation to its location. Ordinarily a photoplayhouse must be located so as to attract the greatest number of patrons from the immediate neighborhood, unless, of course, a large photoplayhouse for general patronage be contemplated. In this case a central site on a busy thoroughfare should be chosen.

Theatre Classification.

Most cities have definite laws dividing motion picture theatres into several distinct classes. Usually if the house has a capacity of less than 300 persons ample frontage on the street, without alleys on either side, is considered sufficient. Should the seating capacity be between 300 and 1000, there must be for less than 600 seats alleys at least five feet wide on each side of the auditorium, with six inches in width added for every 100 seats until 1000 is reached. These alleys must empty into a street either at the front or rear of the building.

Exit Passages.

In some cities the passage may begin at the exits and continue to the street or alley, except where the theatre has a balcony, in which case the alley must extend the entire length of the auditorium so as to connect with the balcony at its highest and lowest points. If a passage be necessary beneath the stage or any other portion of the building a fireproof passage can usually be substituted for an open one. If the theatre seats more than 1000 persons it must have, in addition

to the street frontage, alleys not less than ten feet wide on each side of the auditorium.

If a popular-priced photoplayhouse on a grand scale is being planned for the patronage of the masses it should be palatial in design, of colossal dimensions, and arranged to seat the greatest possible number of people. If a medium-sized neighborhood photoplayhouse be desired it should be located on the popular promenade in such a section and planned for a capacity of from 1200 to 1400 persons. The smaller theatres are rarely built at the present time except in local neighborhoods where the anticipated patronage is limited.

Class of House Desired

After it has been decided to which class the proposed house belongs, the next thing to be considered is whether it would be a good investment to utilize some of the front space for stores, offices, or both. Local ordinances should be carefully studied in order to better comprehend their restrictions. Where there be an opportunity for decided improvement by transgression this subject should be taken up with the proper authorities without delay, for the purpose of securing authoritative consent for the contemplated changes. Much good may result from persistent effort, especially where justice be on one's side.

Exterior Appearance.

Buildings devoted to a new kind of enterprise should have a special architectural design of their own, instead of being mere modifications of existing types. Such ideas of originality in design have not yet been developed in this country in

connection with the motion picture theatre, although in these days of keen competition every resource should be called upon to improve the character of the house and its program. The more appropriately designed house, presenting its pictures in the more artistic or unique manner, and treating its patrons with due consideration and politeness, is bound to have greater success than its competitor who continues in the beaten path.

Interior Decoration.

The decoration of the motion picture auditorium may be more ornamental than that of an ordinary theatre, the better to satisfy a more general taste. The exposed front and entrance lobby should, however, be the most striking feature in order to attract the attention of passers-by. For the same reason a conspicuous and well located ticket booth is also a decided advantage. Experience has taught that a ticket booth resembling a circular kiosk, placed near the front of the outer lobby, is the most practical.

Each photoplayhouse should have its own individual design, expressing as nearly as possible the purpose of the building. Suitable and genuine materials should be employed for the construction of its exterior, and not spurious imitations of other materials. The advertising or poster space, if possible, should be incorporated in the design, making it unnecessary afterward to mar the complete effect by separate signs or posters.

Display of vulgar taste is always to be avoided,

as a carefully designed photoplayhouse is bound to draw patronage. Motion picture theatres, unlike regulation theatres, are too often degraded by illy-designed stock theatre fronts, that neither harmonize with nor enhance the design of the building, and they rarely ever save money for the owner.

Auditorium. The motion picture auditorium presents practically the same problems as does that of a regular theatre, except that the sight lines in a motion picture house must be truer. The proscenium opening must be wide enough to admit of a full view of the screen from the extreme sides of the audience hall, and the spectators in the last row of seats underneath the balcony must be able to see two or three feet above the top of the screen. In like manner those in the last rows of the balcony must have a full view of the screen underneath the top of the proscenium opening.

The Stage. The motion picture theatre, whatever its form, requires a stage, not only for the purpose of presenting variety or musical numbers on its program when desired, but to obtain when the stage is darkened a shadow box effect that is most desirable. This shadow box arrangement affords relief to the eye by placing the picture farther from the spectator, and gives added depth to the picture itself. Aside from this, it permits the display of pictures in a fully lighted auditorium, provided no direct rays of light are permitted to reach the screen; a decided advantage in picture

presentation. A few cities foolishly prohibit the introduction of a stage in a motion picture theatre.

Darkness Undesirable.

Complete darkness, so common in motion picture auditoriums in this country, rarely enhances the effect of a picture. This unnecessary gloom never pleases the audience and seriously interferes with the prompt seating of patrons. The showing of a comedy picture is assuredly better in a lighted auditorium than in a darkened room. Laughter is contagious, and when one sees his neighbor in paroxysms of laughter he laughs, too. Subdued light has a much less irritating effect on the eyes than complete darkness relieved only by reflected light from the screen, and a lesser degree of darkness is already one of the insistent public demands.

Managers now realize that the soft amber and rose tones of illumination employed in many higher class motion picture theatres add greatly to the attractiveness of the silent drama, and patrons are made more cheerful and have become more interested in the productions shown on the screen since the introduction of partial auditorium lighting. In any event, it is certainly wiser to make provision that will permit the showing of pictures in any degree of light. It is also important that picture theatres have dressing rooms for the accommodation of artists presenting additional acts on their program.

The seating arrangement presents a far more

Seating.

serious problem in a motion picture theatre than in a regulation theatre. In the latter persons arising to permit the passage of others only obstruct the view of the stage for a moment, which is not always important, as one can usually hear the dialogue, and continue to follow the thread of the story, but with a photoplay the same obstruction effectively breaks the continuity of thought and if continued is likely to ruin one's appreciation of the entire play.

The agitation for a law limiting the number of continuous chairs in a motion picture theatre row to eight seats, instead of twelve, thirteen or fourteen, because of this constant interference with the view, is not without reason, considering the present insufficient passage room between rows. The proper amount of space between rows, 36 inches instead of 32 inches, would permit the free passage of persons without the necessity of anyone rising, and would put an end to this agitation that threatens real loss of seating space.

GROUND FLOOR THEATRES.

Legal requirements, as well as site limitations, often radically affect the plan of a photoplay-house. Several states prohibit balconies in motion picture theatres. In such states, of course, the auditorium must be confined to one floor. There are other cases where it is less expensive to plan the audience hall on the floor, if sufficient space can be secured.

Where the depth of the premises is not enough or where economy of space is desired, ground-floor picture houses may be planned with the rear section of seats sweeping high, like modified circus seats. Then a low ceilinged lobby and even shops, if necessary, may be installed beneath the rear section of seats, as suggested in the plan displayed at the close of this chapter. Reference to the illustration will show that the entrance should be through ramped tunnels to the middle of the auditorium with access to the rear rows up stepped aisles placed alongside each tunnel. In an auditorium thus planned the height of the ceiling at the rear might be gradually increased to good acoustical advantage.

Lobby Underneath the Seats.

If singing or talking acts be desired as part of the program, considerable thought should be given to acoustics when designing long narrow houses, as sound propagation is usually imperfect in this form of building. Heavily curved ceilings, deep recesses and domes should also be carefully avoided.

Additional comfort may be afforded by an efficient heating and ventilating system. Clean fresh air, introduced in proper quantities at the right temperature, is always appreciated by the public, either in winter or in summer, and this fresh air should penetrate the breathing zone instead of going direct to the floor and chilling the feet of the spectators. Other things being equal, the

Comforts.

house affording the best ventilation and most comfort will have the largest audiences.

THE AIRDOME.

The Airdome is a summer form of motion picture theatre. Where there is sufficient width the side spaces of an airdome should be embellished with attractive flower beds, arranged in banks with white gravel paths winding about them. If possible the grounds should be inclosed within a green latticed fence or wall, decorated with quick growing vines, and topped with a string of small, vari-colored electric lights.

Daylight Entertainments

Where the depth of the lot is enough to permit an extension of at least fifty feet behind the screen, rear projection should always be employed, with the projection rays boxed in by a black-lined inclosure extending from the machine booth to the rear of the screen. This inclosure arrangement will produce an intensified light on the picture and allow good presentation in glaring daylight, if the screen frame be formed like a shallow shadow box as well. Airdome matinees for ladies and children at half-price would be a novel and attractive feature that would substantially add to the revenue.

Seating.

Slat-seated benches should be used so as to shed rain water freely, and they should be aligned in straight rows with a twenty-two inch space allowed for each seat. The necessary number of circular, woven-straw seat cushions commonly

used for such purposes should be freely distributed among the audience.

In the exterior architecture of the airdome a touch of the bizarre and fantastic is by no means out of place. A design of the conventionalized Egyptian, Byzantine or Chinese styles would, of course, be preferable to a mistaken attempt at originality leading only to triviality or vulgarity.

THE SCREEN.

The screen and its position are controlling factors in the planning of a motion picture theatre. Since the screen is the focal point for the audience, the general design and decoration of the interior should aim to concentrate attention on that point.

Position of Screen.

The position of the screen is largely influenced by the quality of pictures desired. For ordinary front projection a screen should be located eighteen or twenty feet behind the proscenium opening to give a shadow box effect when the stage is darkened. The farther behind the opening the screen is placed the better, but great care should be taken not to install it so far back that spectators sitting on the extreme sides of the auditorium would be deprived of a full view of the screen.

Screen for Rear Projection.

Probably the best screen for use in a motion picture theatre where conditions will permit is a translucent screen for rear projection, where the picture is thrown from behind instead of from

the front. Rear projection requires a space of about fifty feet between the machine and screen for good effect, although some arrangement might be perfected for diminishing that distance by the use of an intermediate mirror for reflecting the picture between the machine and the screen. In the use of either front or rear projection, the screen should be raised about two feet above the stage level so as to present a perfect view from every seat in the house. Any extraordinary lifting of the eyes to view a picture soon tires the optic nerve and produces drowsiness.

Brilliant Picture Desirable.

As regards visual requirements, the tendency is now toward smaller and better lighted pictures. The size of a picture depends upon the distance of the throw and the amperage of light. A twelve-foot picture is considered "life size." A well lighted picture of this size should be the limit for a fifty-foot throw, a fifteen-foot picture for a seventy-five foot throw, and for a hundred-foot throw or longer any size that may be brilliantly illuminated and that will not show living figures that appear from the rear seats much larger than normal

The following table copied from Richardson's Motion Picture Handbook, an invaluable text book for managers and operators, will furnish a scale of relative widths and heights, together with the greater cost of producing larger pictures:

Light Table.

Width in feet.	Height in feet.	Area sq. ft.	Area increase in sq. ft.	Percentage of increase area.
6	4.40	26.4	....	..
7	5.13	35.9	9.5	36
8	5.87	36.9	11.0	31
9	6.60	59.4	12.5	26
10	7.33	73.3	13.9	23
11	8.07	88.7	15.4	21
12	8.80	105.6	16.9	19
13	9.53	123.9	18.3	18
14	10.27	143.7	19.8	16
15	11.00	165.0	21.2	15
16	11.73	187.7	22.7	14
17	12.47	212.0	24.2	13
18	13.20	237.6	25.6	12
19	13.93	264.7	27.1	11
20	14.67	293.3	28.6	11

While it may require a stronger light to project a picture through an indirectly lighted auditorium the result is well worth it, especially with comedy pictures. Even with drama, darkness does not really increase the interest, a dimmed light being preferable to none at all. Just so radically as the motion picture differs from the spoken drama, so must the manner of its presentation show innovations in stagecraft.

Materials For Screens.

There are many good and some bad screens on the market today. There can be very little objection to a screen of hard plaster laid on metal lath and mounted on a frame of non-combustible material. Such a screen affords more rigidity than a cloth screen, which is susceptible to atmospheric disturbances. The above refers only to screens for ordinary front projection. The best

screens for rear projection are made from ground glass, a rigid substance that permits of various surface treatments.

Screen Surfaces.

There is, however, a great difference in screen surfaces. Much depends upon the use to which the screen is subjected. The function of a screen is to reflect light, and light rays always travel in straight lines. If the screen has a matte or roughened surface, instead of a polished one, a decided advantage is obtained, as the light rays are slightly diffused in reflection and a better picture is the result.

For a wide house a special surface that will distribute the rays at a wider angle is desirable, while for a narrow house a more brilliant surface that concentrates the light is better. The exposed surface of all screens should be outlined with a dull black border to give better definition and impart a beneficial effect to the picture. This border should be painted with ordinary dry lampblack mixed with a preparation of one-third linseed oil and two-thirds turpentine.

THE PROJECTION ROOM.

The proper location of the projection room is also a serious question in designing a motion picture theatre, a factor of greater importance than is generally imagined. Yielding to a tendency to imitate rather than originate, architects are generally inclined to copy blindly the bad examples set by incompetent designers. Whatever

the distance of throw, the angle of projection should be as nearly level as possible, and ought never to exceed fifteen degrees. The flatter the throw, the better the projection. In Chicago and other Western cities projection rooms formerly placed high are now being removed to the main floor.

Distortion of Picture.

The center beam of light should strike the center of the screen at a right angle. Any departure from this condition must produce a distortion that is made manifest in what is called a "keystone effect." That is, when the beam of light comes from an altitude, the picture will resemble in appearance an inverted keystone, larger at the base than at the top. The higher the altitude the greater the degree of distortion. When the angle of light is above fifteen degrees the distortion becomes evident to the eye, and the screen must then be tilted backward to offset this defect. This again affects the view of the spectators in another way, for the screen will not appear to be plumb. Unless the tilting be artfully concealed, it is sure to be detected by the observant.

Level conditions for a projection room are rarely feasible in front projection, unless the booth be placed on the main floor. This is not generally done because of its impracticability and the disfigurement that results from placing a projection booth in the main foyer. Rear projection is far preferable where the conditions make it possible. It admits of placing the projection

booth, with all its heat, noise and danger, completely away from the audience, and also saves the extra electric current required for projection through a lighted auditorium.

Where the distance from the machine to the screen is about fifty feet, so that a four-inch E.F. objective lens, or even a larger one, may be used, rear projection is ideal. The projection rays may be confined in a horn shaped, black lined funnel, extending from the projection machine to the screen with the small end of the funnel attached to the projection machine. With rear projection, the film must be placed in the machine with the emulsion side toward it instead of toward the light, which is the practice in front projection.

Avoid High Projection Rooms.

Where the balcony is deep and its rear too high the projection room may be placed on the mezzanine that forms the lower-balcony, with independent means of entrance and exit. The lens and observation ports are then made to face an extra wide tunnel piercing the balcony. Otherwise it should be placed on the rear level of the balcony, with the lens openings sufficiently high to permit the free passage of the light rays emanating from these ports above the heads of passers-by. Unless the throw is unusually long the projection room should never be placed like a conning turret, high above the rear level of the balcony, because of certain evident distortion.

Size of Projection Room.

A projection room must not be less than forty feet distant from the screen, and, to accommodate

two machines, should not be less than seven feet high and nine feet square. If three machines are to be employed, the width should be increased to twelve feet. The floor of the projection room must be fire-proof and absolutely rigid, to prevent vibration. Self-closing exit doors, preferably of the gravity sliding type, should be placed on each side of the room. If an ordinary hinged door be used it should swing outward, as usually required by law for all exits.

Lens and Observation Ports.

The lens and observation ports should be equipped with automatic closing shutters. The law usually requires that these openings be operated by fusible links to guard against fire. The writer has always entertained a prejudice against fusible links, on the ground that they may, or may not, burn at the critical moment. For this reason he favors an ingenious device employed in Germany, that insures the constant attendance of an operator at his post. It is a special attachment linked to a depressible metal platform fitted in the floor, and upon which the operator stands to manipulate his machine. His weight depressing this plate acts through the linked connections as a pedal to hold the shutters open. The instant he abandons his post the relief of weight from the platform pulls the link and automatically closes the shutters. In case of sudden fire fright would impel the operator instinctively to jump off the platform and thereby

automatically close the shutters before the audience become aware of any danger.

Where two machines are used, these platforms could be so connected that a person standing on one would depress the other and hold open both sets of ports. If the operator desired to dissolve one picture into another, his assistant, always present by legal requirement, might temporarily stand on one platform while the desired change was made. A Boston ordinance, recognizing the necessity of operators remaining constantly at their post, demands that the light control valve be always held open by an extension spring, so that a steady hand pressure is required to keep it closed and thereby to give light.

Observation Ports.

Observation ports are usually designed too small, and at improper heights. To be at all useful, an observation port should be about twelve inches wide and six inches high, so that the operator, standing at his machine, two or three feet back from the opening, may see the full screen without craning his neck. The height of the observation port should conform to the height of the operator and the opening should be cut twenty-four inches high. This open space should be fitted with movable metal plates, working in grooves of similar material, one above the other, each six by twelve inches in size. In number, these metal plates should be one less than enough to cover the entire opening, and a clear glass plate should be employed to cover the space left

vacant by the missing metal plate. Many operators, in addition to covering the observation ports, also cover the lens port with a clear glass plate. This is, however, an unnecessary practice, and it only provides another dirt collecting glass through which the picture must be projected.

Vent Flue Necessary.

The vent flue of the projection room should be ample and lead direct to the open. It should be placed immediately above the machine, so as to carry off at once any fumes or smoke resulting from burning film. A flue above each machine would be preferable to a single flue over the entire group of machines. It is essential that the vent flue be composed of non-inflammable materials for its entire length, as it is liable to become intensely hot if there should be a serious fire. Perhaps the safest plan would be to construct a double flue with a generous air space between the inner and outer tubes.

Ventilation.

In addition to the vent flues the projection room should have other ventilation. The operating room is often located directly under a roof of tin or of other material quickly heated by the sun, and with the heat from the machines, the temperature often becomes unbearable. Its ventilation, however, should not come from the auditorium, as that air is already vitiated and overheated.

Rewinding Room.

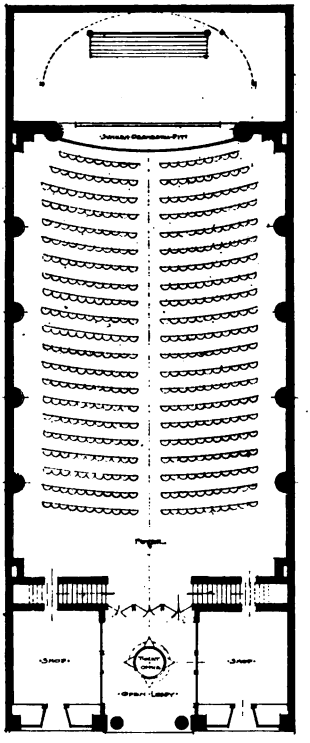
An extra fireproof room, directly adjacent to the projection room, for rewinding film and for

other necessary mechanical operations, should also be installed. The exit doors from the projection room should lead directly into and through this ante-room, and there should be exits from this outer room into a section outside of the auditorium.

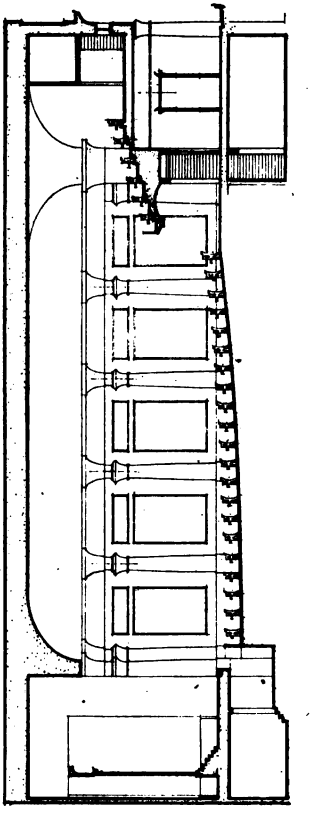
Chemical Fire Extinguishers.

Small chemical tanks should be attached to the ante-room side of the exit doors from the projection room, with exhaust nozzles penetrating into the interior of the latter room. This will enable the operator in an instant to turn on the cocks of these tanks and flood the projection room with a fire-extinguishing fluid in case of sudden fire.

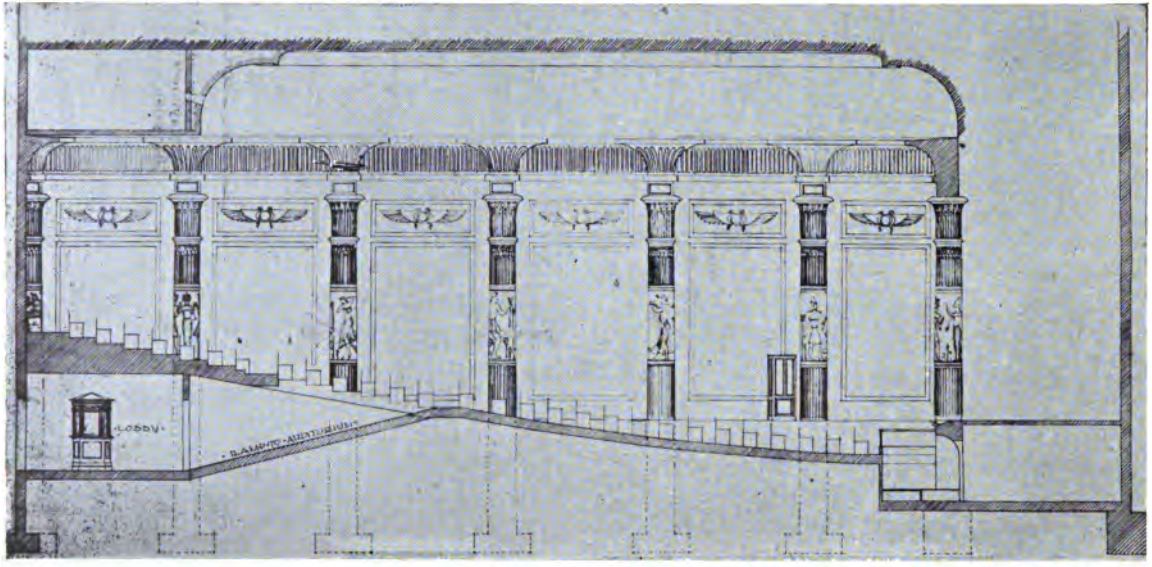
As a matter of fact, the careful operator should never have a film fire. Such a contingency will not occur if his machine is kept in good working order—clean and well lubricated. In case of an accident, however, there should be buckets well filled with clean sand, and a wet blanket readily at hand to beat out the flame.



Main Floor Plan of Model Photoplayhouse (Egyptian)



Longitudinal Section of Model Photoplayhouse (Egyptian)



Longitudinal Section Model Photoplayhouse with Lobby Underneath Rear Section of Seats

CHAPTER VIII

SAFETY

General Arrangement.

THE general arrangement of a theatre must conform to a design which will in every detail provide for the safety of the audience. Safety should have at all times a predominance over all other considerations in planning a building of any kind, especially a theatre. In order to insure safety and to obviate tendencies that hinder safe construction four primary principles must be studied and maintained. First, the building must be completely isolated from other property. Second, the stage must be capable of instant isolation from the auditorium, by the closing of the proscenium opening with a fire-resisting curtain. Third, the highest seat in the audience hall must never be higher than the top of the proscenium opening, so that all seats will be as near as possible to the street. This is a condition adhered to in London theatre construction, by submerging the main floor of the auditorium below the street level. Fourth, and last, every department of the theatre must have two independent exits, preferably one on each side or one at each end, communicating directly with the street. The exits from the upper sections should have openings only at the top and bottom, with no intermediate doors to confuse patrons in time of danger. The entire plan of the house should

be simple and symmetrical, each section being separated from the other.

Wherever possible, there should be visible signs of safety, not by printed notices that might alarm the timid, but by substantial construction designed to give a feeling of security. Where stability is secured thereby, simulation of stronger materials may be employed. For instance, the plastering of interior walls in imitation of solid blocks of Caen stone is effective, for, in addition to imparting a sense of security, such plastering is highly decorative.

Inadequate Fire Laws.

A quarter of a century ago most American cities were without definite laws regulating theatre construction. Since then, however, the frequency of theatre fires has frightened the authorities into forcing upon the American public everywhere unjust and inadequate laws, that neither improve the theatre nor safeguard the public.

These unwise laws are not only bad in themselves, but they are usually badly administered by divided authority. A building department requires one thing, the health department another, the fire department still another, and a chaos of conflicting regulations is the result. It would be a far more satisfactory arrangement if all of these bodies were consolidated under some central authoritative control, whose dictum would be final.

Panic, Not Fire, the Real Danger.

Fire is not the only danger to which theatre patrons are subjected. Experience teaches that in most theatre fire calamities the great majority

of victims have perished from suffocation as a result of panic, without even having had their clothing scorched. Disregarding the poorly planned theatres with badly arranged or insufficient exits and the theatres constructed with combustible materials, careful consideration should be given to the principal causes of theatre fires and panics.

According to statistics compiled by Edwin O. Sachs, a noted architect and an international authority on theatre construction, the average life of a theatre is about eighteen years. This same statistician says that the annual number of theatre fires in the United States almost equals the number of similar catastrophes in all of the European countries together. Serious theatre fires have an uncanny custom of happening in batches of twos and threes within short periods of each other.

Origin of Most Fires.

The statistics of Mr. Sachs further indicate that theatre fires are on the increase and the yearly average is now close to forty. They show that over fifty per cent of theatre conflagrations have had their origin in or near the stage section, the immediate causes of these fires being defects in gas installation, careless or defective equipment for lighting with gas, unprotected gas lights, defects in the heating apparatus, presence of fireworks, explosions, faulty lamps, firing of guns, and errors in electric wiring. The introduction of electricity instead of gas has not lessened ma-

terially these causes, as faulty insulation and short-circuits have proved as dangerous as gas defects. Since the stage section is the point where the majority of theatre fires have their origin, it should receive the greatest amount of attention from the builders. The proper construction of the stage, its safe equipment, and the installation of the electric wiring thereon must receive the most thorough attention.

Avoid Openings to Adjoining Property.

No doors, windows or other openings should be allowed in stage walls adjacent to neighboring property, because of the danger of fire from without the premises. The same argument serves against the legalized open court with emergency exits leading to it. Emergency exits, being rarely used, are almost useless and likely to produce panic, and should a fire occur in an adjoining property, such exits would be a source of danger, and the open court would become a disadvantage. For this reason European theatres are entirely isolated from surrounding buildings, and open courts not equal to the width of a street are never allowed.

In accordance with sane principles for stage construction the proscenium wall, protecting the auditorium from the stage house, should be constructed absolutely fireproof. Notwithstanding the legal provision made in many states that this wall must be built of heavy brick, substantial hollow building tile sufficiently heavy to withstand the high water pressure from fire hose is far

better and safer. This is also true of other heavy walls.

Fire Curtain.

The large opening in this wall through which the spectators view the stage is now protected, in all theatres, by a fire curtain. The best of these fire curtains are made of sheets of perpendicular asbestos cloth, sewn together with pure asbestos sewing twine. The completed curtain should weigh not less than two pounds to the square foot.

An asbestos curtain, because of its weight, must have to hold it unusually firm fastenings and brackets securely bolted to the proscenium wall, and the cables holding the curtain should run first over these brackets and then over a head-block to counter-weights that slide in a groove. These weights should be so balanced that the curtain may be easily manipulated from either the fly gallery or the stage level by a small manila hand rope. The curtain should overlap the proscenium opening on the inside at each end of the arch by not less than eighteen inches.

Fusible Links Not Reliable.

It is a debatable question whether the asbestos curtain, controlled by a fusible link, as required by law, would or would not come down in case of fire. The fire curtain at the fatal Iroquois Theatre fire in Chicago, equipped in this manner, stuck at the critical moment, and allowed the gas and smoke to pour underneath the bottom of the partly closed curtain into the auditorium, asphyxiating most of the victims of this sad catastrophe.

It is the conviction of competent authorities that if the lowering of the fire curtain depended upon an attendant rather than upon the automatic action of a fusible link, it would be far more certain of operation.

Emergency Door in Fire Curtain.

It is better to have the asbestos curtain disguised by pictorial decoration, so as not to create alarm whenever it is lowered to test its working condition. A small fireproof door installed in this curtain is also most desirable, for should a panic occur and the curtain be dropped the immediate appearance of some responsible person on the stage would be of invaluable aid in quieting the audience. Anyone with sufficient presence of mind to use this door would be likely to have enough composure to demand the immediate attention of an audience and might by reassuring advice prevent a panic.

The vast quantity of inflammable articles usually assembled on the stage also increases the liability of fire. Such articles should be thoroughly fireproofed, and where it is impossible to construct them of incombustible materials precaution should be taken that they are separated widely enough to prevent a general conflagration in case of a sudden blaze in one stage section. Carpenter shops, scene docks and storage rooms should also be separated from each other, and the boiler room should be isolated from the stage itself.

Dressing Rooms.

For the sake of convenience dressing rooms are usually installed on the side or rear of the

stage section behind fireproof walls. Although the laws of some cities forbid it, there is no reason why well ventilated dressing rooms should not be placed underneath an orchestra floor, if a safe mode of egress be provided.

Escape of Smoke

The skylights over the stage, controlled by the fusible links usually prescribed by law, are of very doubtful value. It would be far better to substitute large automatic ventilators in the stage roof for the escape of gas and smoke, as the accumulation of gas generated by fire and its subsequent explosion on the stage might blow the proscenium wall into the auditorium in an incredibly short space of time. If it be inconvenient or unsightly to furnish similar ventilation in the auditorium ceiling, vent-flues could be placed high above the stage opening in the proscenium wall to insure better air circulation. The air circulating at this height would form a draught strong enough to clear the hall of gas or smoke in time of conflagration and in normal times serve as an excellent means of ventilating the auditorium.

Every theatre should be equipped with the most improved and modern devices for quickly detecting, suppressing or reporting fires, and each manager should insist on a daily fire drill. Regular examinations by fire experts should also be made of all safety devices, fire alarms, standpipes, chemical tanks and ventilators; and the clearance of all exits and entrances should be strictly supervised and enforced.

Escape for Actors

Proper provision should be made for the safety of the actors and the stage personnel by the establishment of ample and well-lighted passageways, with stairways and exits leading directly from the stage and dressing rooms to the open on either side of the theatre. As a substitute for stairs a continuous slide, similar to those provided at amusement parks, would be an excellent innovation for the use of actors and stage hands, who could be easily rehearsed in its use.

The fly galleries and rigging loft, too, should have iron ladders or stairways on each side of the stage, leading therefrom as a means of protection to the workmen there employed. Greater safety for the stage section can be secured by good planning and construction than by any other means. Where it is possible iron construction should take the place of wood, and the ventilating apparatus should be always kept in perfect working order.

EXITS.

Safety of Audience.

Although the auditorium is less liable to fire, the safety of the audience, nevertheless, is of supreme importance. The first problem to be considered in this connection is that of exits.

The exits of a theatre embrace all avenues of egress, including the entrance lobby, foyer, all passages and stairways, in fact, the various routes that the persons therein must travel to escape in time of danger. A theatre fire may become fatal

within five minutes from the time of its discovery, and it is therefore vitally important that proper and sufficient means be supplied to provide speedy exit in such emergencies. Even if the alarm should prove to be false similar provision is necessary to prevent death and injury from panic.

Lobby and Foyer.

The distribution of exits depends entirely on the plan of the theatre and the nature of its site. The problem of quick and safe departure rests largely on a proper sub-division of the various departments, each sub-division having direct independent means of egress on both sides of the building. In no case should exit passages meet or cross one another. The number and size of exits must be determined wholly by the seating capacity of the theatre.

The Entrance Lobby and Foyer.

The principal avenue of escape is the entrance lobby, which should be well arranged and free from obstruction. An intermediate avenue, and the next in importance, is the foyer. The natural means of escape that a panic-stricken audience will seek is the one by which they entered and with which they are thoroughly familiar. This would be through the lobby and foyer. Accordingly, these should be planned large enough for such emergencies, and the most useful design in this connection for a foyer is that of a semi-circular inclosed passage surrounding the rear and the rear sides of an audience hall.

The foyer should be from eight to ten feet wide in the rear section and five or six feet in

width at the sides (depending on the capacity of the auditorium). This will afford ample room for the escape of a frenzied mob in time of panic and allow sufficient promenade space on normal occasions. The building laws of the city of New York demand a space sixteen feet wide behind the last row of seats on the main floor as a means of escape. Such an enactment was possibly prompted by a praiseworthy desire to give ample room for the patrons to pause in their flight and ponder over the best means of escape, though this is a most unlikely action on their part.

The inclosing of the foyer passage will aid in excluding from it smoke or gas in time of fire and will also limit the sound area of the auditorium during the performance. It will, in addition, allow the passage to be independently lighted and ventilated, both desirable conditions in times of panic.

Width of Exits.

The minimum width of an exit for 500 persons is usually five feet, with an additional twenty inches for each 100 persons in excess of that number. All exit doors should have panic bolts and swing outward, and each door should be plainly labeled so that no mistake can be made. Cloak room or toilet door should also be marked as such to avoid their being mistaken for emergency doors. In the opinion of the writer narrower exit doors and a greater number of them would be more desirable than wide exit doors. Two exits three feet wide are worth more than

one exit six feet wide, as people are less likely to stumble in a narrow way and more people could pass through the two exits.

Stairways.

All stairways should be direct and of ample width. They should not lead to other stairs, and where possible should have the same formation on both sides of the building. All stairs should have uniform treads and risers to prevent stumbling, and all balcony aisle steps should be illuminated in the manner described under the head of "Lighting" for the same reason.

Anti-Smoke Towers.

The factory law in many of our states requires anti-smoke or fire towers in factories and schools, but no law has yet prescribed the same regulation for theatres. Such towers, having large doors equipped with panic bolts at each level, would be far more efficient for a hurried escape than the open grille type of exterior fire escape now in general use. These towers, inclosed in fire-resisting walls, could easily be placed in the forward corners on both sides of the auditorium, in place of the unsightly stage boxes now in vogue, and provided with emergency stairs or even sliding chutes similar to those described for the escape of actors and stage employes. The remaining space might be devoted to convenient toilets, thus eliminating useless box recesses that produce imperfect acoustics. The vista openings now used for stage boxes could then be covered by ornamental wall panels that would artistically assist in focusing attention on the stage.

ALLEYS OR OPEN COURTS.

The dark alleys or open courts usually required by law in no way insure safety for theatre patrons in time of danger. These alleys, except where they provide means of egress for actors and stage hands, are a waste of valuable space. Terror-stricken crowds only seek ways of escape with which they are familiar, and nothing in the history of theatre fires gives assurance that these alleys are useful even for firemen.

The question of open courts is also a serious one financially. With a plot 100 feet square, valued at $306,000, an alley 10 feet wide on either side reduces the productive area to 7200 square feet, and a space of 2800 square feet, valued in the same ratio at $84,000, is rendered absolutely unproductive.

Fire Escapes.

The open grille type of fire escape, which also was provided to satisfy a whimsical requirement of the law, is a frightful source of danger rather than an aid to escape. Timid people balk at the risk of going on to its latticed platform in time of danger, and thus may create a temporary blockade. In such a situation, should the high heel of a woman's shoe be caught between these iron slats (as it might easily do), a catastrophe might be precipitated. And the raw iron of which these fire escapes are composed is a rapid conductor and a lasting conservator of heat, that easily might be heated to a high degree without outwardly betray-

ing its actual condition. The author recalls an instance of a victim of such a disaster, suddenly aroused from his sleep by an alarm of fire, who in a dazed effort to escape clambered through the bedroom window on to an open fire escape highly heated by intermittent blasts of flame from a window below, and amid agonizing cries for help was barely rescued by the daring efforts of a heroic fireman from being grilled alive on this innocent appearing superheated gridiron.

AUDITORIUM.

The aisles of an audience hall should be ample and increase in width toward the exits. The rows of seats should be spaced sufficiently far apart (thirty-six inches from back to back) to insure free passage, and each seat should be firmly fastened to the floor. The main floor aisles should never have risers, but should be formed with a gradual incline.

Balconies.

Large balconies, if approached from the rear of the auditorium, should be pierced by entrance tunnels leading from a mezzanine floor to the cross passage behind the front loggias. In addition, the stairways should be continued from the mezzanine floor, on either side of the house, to the upper level of the balcony. In motion picture houses, the entrance to or exit from the machine booth should be independent of the auditorium.

If conditions permit, a large circular or oval panel, divisible into two sections and capable of

being readily opened to the sky, should be installed in the middle of the ceiling of the auditorium as a decorative ornament. Otherwise, vent flues should be supplied in the roof of the stage house and connected with the auditorium by large ventilators.

SPRINKLER SYSTEM.

Patented Sprinkler System.

Some adequate provision should be made to deluge the stage with water in case of an outbreak of fire in that section. Should fire occur in the dressing or other rooms, chemical extinguishing tanks are the best known aid in confined areas. The excessive cost of installing an elaborate so-called "patent" sprinkler system compels the serious consideration of a home-made substitute. The regular sprinkler systems on the market works automatically by excessive heat melting an alloy composition sealing the sprinkler heads, thereby releasing the water constantly held in the pipes. This sealing substance melts at a temperature of about 110 degrees Fahrenheit, and when the water is once released nothing but an exhaustion of the supply can arrest it.

This automatic device has the doubtful advantage of working whether any one is present or not, although it is difficult to conceive of a theatre ever being without a watchman on guard. Should it go off by reason of heat generated under tin or glass roofs, or for other causes than heat from

fire, irreparable damage might be done before the flood could be arrested.

Home-Made System.

A home-made contrivance, consisting of two three-inch iron standpipes located on each side of the stage and embedded in the walls that will feed three parallel perforated one-inch pipes, suspended horizontally above the flies, would be cheaper and more reliable. These pipes should be kept empty except in times of fire, when water could be turned on from the stage, or from outside the building by means of double valves penetrating the exterior walls.

For safety from interference, these valves could be installed in glass-fronted box inclosures, to be broken by a blow when necessary. If brass or bronze pipes are used for the overhead sprinkler pipes, five rows of small holes may be drilled in each, about three or four inches apart, without fear of corrosion. The undermost row should be drilled perpendicularly through the pipe and the uppermost row at an angle of 45 degrees, the two intermediate rows being midway between the two first described rows, and drilled at corresponding angles. Such a distribution would afford a wide and ample range of water spray from each pipe. If the pipes used are of iron they are subject to corrosion, and brass nozzles or some equally effective sprinkler head must be employed to prevent the holes from clogging with rust. Similar sprinklers should also be provided for the large workshops and storage rooms.

In the absence of a sufficient local water pressure for such a system a standard automatic air-pressure water tank could be employed in preference to erecting an unsightly gravity tank on the roof. These air pressure tanks are much cheaper to install than gravity tanks, and the air pressure that forces the water upward is easily replenished by a few weekly plunges of a hand pump or they may be automatically regulated by a small motor.

Disadvantages of Hose Installation.

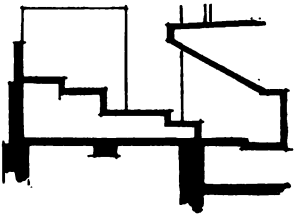
The placing of hose on reels or racks for use in stage fires is without reason; first, because in the event of a sudden and serious fire the person to seek safety without waiting might be the very one relied upon to use the hose; secondly, because pure rubber hose, the quality usually recommended, is quickly ruined by dry-rot after it has been hanging unusued for a short time. But if hose must be bought, it is best to purchase cotton hose, as this kind is the cheapest and most durable. In many theatre fires the hose has been discovered reposing undisturbed on its rack after the fire has been extinguished and the damage done.

Water Curtain.

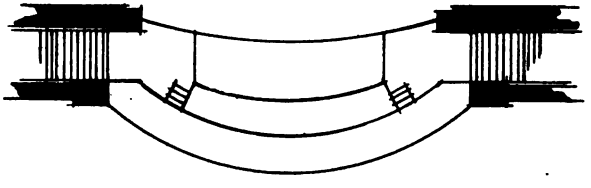
The city of Boston advocates the use of a patented fan-tail nozzle which, when attached to either a high or low pressure standpipe, spreads a huge fanlike spray that serves as a water curtain.

With a fire-resisting roof, solid fireproof party walls, metal exterior doors and metal framed out-

side windows glazed with wired glass, combined with a close observance of the foregoing precautions, any well planned and properly constructed theatre will be immune from fire calamities.

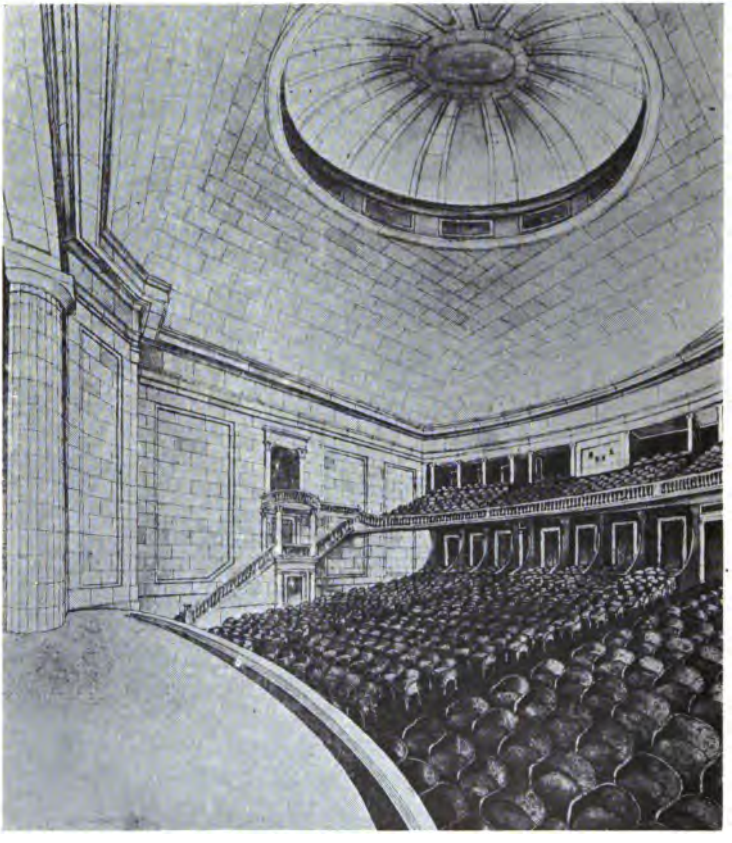


Longitudinal Section



Plan of Orchestra Well

Model Orchestra Well at Wagner Opera House, Bayreuth



View of Model Small Photoplayhouse with Lobby Underneath the Stage

For Description and Diagrams See Pages 213-218

CHAPTER IX

COMFORT

MUCH of the comfort of a theatre is dependent upon the management. Since amusement is largely a psychological problem, neither the line read on the stage nor the scene there depicted is of primary importance. It is the impression produced upon the spectator's mind that is the underlying factor. A favorable impression can be made only when the mind is serene and receptive and not when it is preoccupied or distracted.

Low Prices as an Aid to Success.

It is therefore the duty of the manager to cultivate mental receptivity in his audience. His principal opportunity to do this is through the comfort he provides and the price at which he provides it. The public today is too wise to be deluded into a belief that increased prices of admission are an assurance of the quality of a performance. On the other hand, an unfavorable mental bias is created by a high entrance fee. No one ever heard a complaint about the performance at a twenty-five cent circus, although the same show costing fifty cents might be termed vile.

All Attendants Should Be in Uniform.

Uniforming each attendant, no matter what his position, is another advantage that will insure courtesy in employes and thereby largely contribute toward the patrons' satisfaction. Proper heating and ventilation also help.

CLOAK ROOMS.

Cloak Room Necessary.

In failing to supply ample and convenient cloak room space American theatre management is sadly at fault. Inadequate cloak-hanging space is usually supplied in some out-of-the-way corner with but one attendant, or two at the most. In Germany it is legally required that there shall be one meter (39 inches) counter space for depositing and receiving wraps for every twenty persons of the theatre's capacity and a separate hook for each seat in the house. These cloak rooms also must not interfere with exit passages.

By the display of a little ingenuity ample provision for cloak rooms could be easily made in America, with little or no loss of seating space. Spaces in the foyer underneath the balcony stairs and against the side walls afford excellent opportunities for counter space, with coat-hanging conveniences behind them. The attendance of sufficient maids, to obviate tedious waiting, is also necessary.

TOILETS.

Convenient Toilets Essential.

Suitable and conveniently located toilets, though vitally necessary for the comfort of theatre patrons, are insufficiently provided in most American theatres. These toilets should not be placed at the foot or the top of narrow flights of stairs, but in accessible positions.

A most convenient plan would be to install toilets in the space now occupied by stage boxes,

alongside the emergency stairs of the anti-smoke tower; toilets for men on one side, and for women on the other side. These toilets should be adequately equipped to meet the needs of the patrons, and the ladies' toilet should have the customary separate room with mirrors and other facilities for arranging the hair and dress. Proper toilets should also be placed in the stage section for the use of actors and those engaged behind the curtain.

SEATING.

Widened Passage Space.

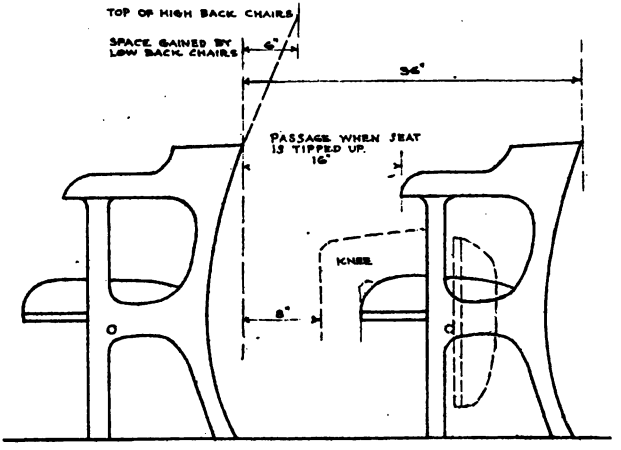
It is in the matter of comfortable seating that American theatres are most deficient. England, though lacking in aisle space, offers the most comfortable seating in the world because of a legal provision for ample passage room between seat rows. The law in that country demands that all seats be spaced 36 inches from back to back, instead of the 32 inches which is the maximum width in this country. To add to that passage space low-backed chairs are employed similar to those indicated in the accompanying cut. It is therefore unnecessary for anyone to arise to permit the passage of a neighbor, and it is extremely doubtful if an Englishman's ideas of personal rights would allow him to stand merely to accommodate a greedy management.

This extra space allowance of four inches to each row would mean the loss of the last two rows of seats in an auditorium of twenty rows; a trifling decrease compared with the satisfaction and

increased patronage it would secure. Imagine the luxury of never having one's attention to an absorbing play disturbed by having to arise to permit the passage of a neighbor.

Low Backed Chair Better.

The character of the seats themselves is also a matter of first importance. The diagram showing the increased space taken up by a high-backed chair that leans backward as compared with the low-backed and more comfortable one before referred to clearly indicates that several inches are gained for each low chair used.



Health also demands an erect posture, whether sitting, standing or walking, and every chair should be nearly upright and modeled with only a slight curve to fit the back and support the spine at its lumbar region. The high-backed chairs generally used in America invite a slouching, un-

healthful attitude besides requiring additional space.

Ample Aisles Necessary.

There should be plenty of aisles for hasty exit from the theatre, and no seat should have more than six other seats on either side intervening between it and the aisle. The wider the seats the more comfortable they will be. Width of seats, however, is not so important as width between rows.

Side Boxes.

With a mean width of from 20 to 22 inches for each seat and an average of four feet each for center or intermediate aisles, and three and one-half feet for side aisles, an ideal auditorium would be from seventy to seventy-five feet wide between the side boxes or about ninety feet between walls without side boxes. When side boxes are installed only seven seats may be used in the extreme side sections, as the seats then abut against the box fronts and are consequently closed at that end. The use of side boxes transfers the side aisles to the space behind the boxes, where it should be widened to form an inclosed foyer.

Wide auditoriums are preferable to narrow ones, as they allow more seating near the stage and decrease the relative distance to be traveled to the exit doors in times of panic. Where it is possible the middle section of the auditorium, which is the one affording the best view of the stage, should be utilized for seats instead of for a middle aisle.

Closed boxes in the rear of the audience hall

Value of Inclosed Rear Boxes.

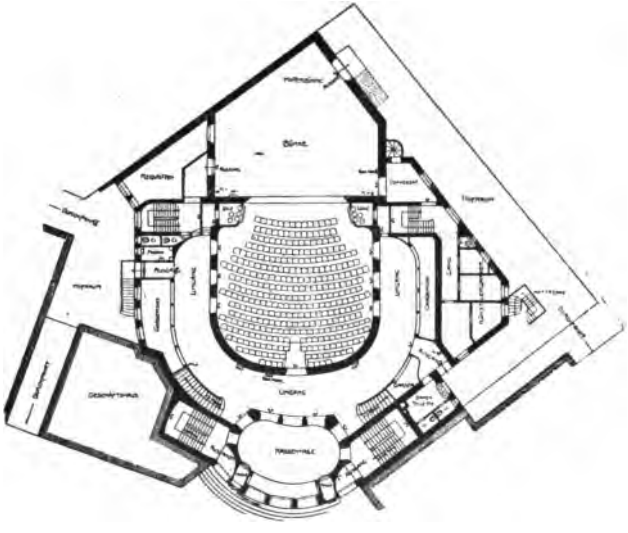
and sometimes at the rear of the balcony give a more finished and cosey appearance to a theatre, and their inclosure helps to confine the acoustic space within better limits. Open loggias are also an excellent decorative feature for the front of a balcony; and they serve to popularize the really best seats in the theatre, especially in a picture house. Extra wide passages should be provided in the rear of these loggias so that patrons may enter them freely.

Tip-up chairs, preferably with folding arms that close with the action of the seat and thereby grant extra space for thoroughfare, are most desirable. If upholstered in leather or a good imitation of leather they are cooler and more comfortable than when covered with tapestry or plush. Close-woven cane chairbacks and seats are also sanitary and cool. Chairs upholstered in plush, besides being hot and uncomfortabe, harbor disease germs and dirt.

SANITATION.

Besides good ventilation there are other features pertaining to health and aiming toward the comfort of theatre patrons that should have attention. The use of soiled or heavy carpets for floors, cloth-upholstered furniture, cloth wall coverings, or heavy draperies, in all of which dirt and disease-germs are bound to lurk, should be avoided. The drainage and plumbing of a theatre, too, should always be of the best, and all

refuse or rubbish should be removed promptly and regularly. The theatre itself and every thing about it should be constantly kept clean and in a sanitary condition. As contributory to this end it would be well to institute a system of periodical inspections that would promote the health and comfort of the patrons and staff.



Model Plan of Schauspielhaus, Stuttgart, Germany

CHAPTER X.

HEATING AND VENTILATION.

THESE two subjects are so inter-related and so dependent one upon the other that it is difficult to disassociate them. Perfection in both substantially adds to the comfort of those attending the theatre. Fresh air is a prime necessity of life. Man can live for days without water, and for weeks without food, but without air he cannot live more than a few minutes. A constantly renewed supply of air at the right temperature is therefore essential. Considering that good ventilation is the first rule of hygiene it is astonishing that hardly a theatre in America is equipped with any scientific method of ventilation, good, bad or indifferent, although there are many excellent systems on the market. In the discussion of these two subjects the first to be treated will be heat. Heat is not a substance; it is a condition set up by an incessant movement among the restless tiny molecules that compose all matter. The demand for artificial heat depends largely upon climatic conditions and the habits of the people in the community. In Europe 59 degrees Fahrenheit is considered comfortable; in America the custom is to maintain about 70 degrees.

The general requirements of a heating and ventilating plant for a theatre are:

(1) Uniform distribution of heat, and the prevention of its waste by premature escape.

(2) A thorough diffusion of fresh air throughout the zone in which persons breathe, and a provision for avoiding perceptible currents of either warm or cold air.

(3) A prompt removal of all foul air.

Methods of Heating.

The methods of heating now in vogue may be divided into two general classes—direct and indirect radiation. The one that we shall consider is direct radiation. There are three means of producing heat by direct radiation: by hot air, steam or hot water. To produce heat by hot air requires a special furnace, which is difficult to regulate and is not sufficiently reliable for theatres. Heating by hot water, while it costs more to install, because of the increased number of fittings, is a trifle cheaper to operate, but it is not suitable for theatres because of the likelihood of its freezing in cold weather. Steam is therefore the only remaining system.

The following table of the relative cost of each method may aid in the process of elimination:

	Hot Air	Steam	Hot Water
Relative initial cost of apparatus	9	13	15
Relative cost of operation for five years	29¾	29	27

Steam Heating.

It would appear from this table that direct steam heating is the best system to meet all the heating requirements mentioned before. The principal advantage is its ability to heat uni-

formly, regardless of wind action. It is the cheapest and quickest and is also comparatively immune from freezing. Direct steam is broadly divided into two general classes, the gravity circulating system and the mechanical circulating system, the distinguishing characteristics being the manner in which the condensation water formed in the radiators is returned to the boiler. In the first type the condensate enters the boiler by gravity, and in the second type the condensate is returned to a receiver and is then forced into the boiler by a pump or return traps. Direct steam heating also lends itself to combination with other systems by means that will be considered later. The law usually requires that heater rooms shall not be located under the auditorium, stage, lobby or exits of the theatre.

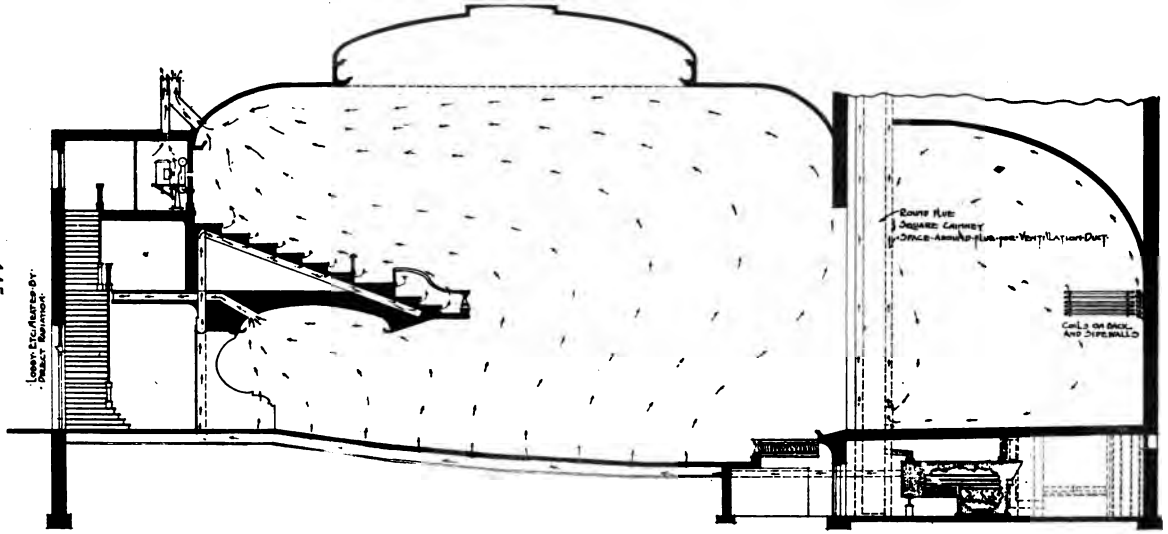
Amount of Heat Required.

To install a heating apparatus it will first be necessary to ascertain the amount of heat required for a given building. To compute the number of feet of direct radiation required for a building, divide the cubic contents of the various rooms by the following factors:

	Divide by
Dressing rooms, one side exposed	40 to 50
Dressing rooms, two sides exposed	30 to 40
Auditorium	60 to 100

Where there are windows, doors or other exposures employ the lower divisor above quoted.

The heat in an auditorium should be considerably lessened or turned off completely after the audience is seated, except where mechanical pro-



Longitudinal Section of Heating Diagram Indicating Ordinary System for Theatres

vision is made for introducing fresh heated air to replace the heated foul air constantly being expelled.

STEAM HEATING PLANTS.

Steam heating plants are divided into three distinct parts; the boiler or steam generator, the radiators, and the supply and return pipes connecting the two. The best boiler is the tubular boiler. There are many varieties of this useful type of boiler, the horizontal and upright tubular boiler and the firebox type of tubular boiler. Horizontal tubular boilers are largely used for factories and power plants, and the upright tubular boiler lacks the capacity of the fire-box type, which requires no brick setting and is cheaper to install than other forms of tubular boilers. The cast-iron sectional boiler in common use also has not the capacity nor stability necessary for heating a large theatre.

For indications for setting a boiler, see the diagram on Page 145 showing the heating of a theatre. The following table, compiled by the Atlas Engineering Works, Indianapolis, Ind., may aid in the selection of the size of boiler required:

PROPORTIONS OF HORIZONTAL TUBULAR BOILERS:

SHELL			THICKNESS		TUBES				
Nom. Rated H.P.	Diam. Inc.	Length feet	Shell Inc.	Heads Inc.	Diam. No.	Diam. Inc.	Length feet	Heat Surf. sq. ft.	Grate Surf sq. ft.
15	36	8	¼	⅜	26	3	8	214	5.8
20	36	10	¼	⅜	26	3	10	266	8.3
25	36	12	¼	⅜	26	3	12	318	9.5

Nom. Rated H.P.	Diam. Inc.	Length feet	Shell Inc.	Heads Inc.	Diam. No.	Diam. Inc.	Length feet	Heat Surf. sq. ft.	Grate Surf sq. ft.
30	40	12	¼	⅜	34	3	12	404	.12
35	42	12	¼	7–16	40	3	12	464	12.8
40	46	12	9–32	7–16	42	3	12	491	14.6
45	48	12	9–32	7–16	48	3	12	551	15.3
50	48	14	5–16	7–16	40	3½	14	630	16.
55	52	14	5–16	½	44	3½	14	693	16.7
60	54	14	5–16	½	46	3½	14	721	18.
70	54	16	5–16	½	40	4	16	817	20.8
75	60	14	11–32	½	62	3½	14	940	21.5
85	60	16	11–32	½	52	4	16	1045	22.2
100	66	16	⅜	½	64	4	16	1265	25.
125	72	16	7–16	½	82	4	16	1578	29.5
150	72	18	7–16	½	82	4	18	1775	36.5

The size and location of the boiler pit and other minor details should be left to the discretion of the heating contractor.

CHIMNEYS.

Chimney the Lungs of Building

A necessary adjunct to the boiler will be the chimney, which is required for two purposes: to produce the necessary draught for the proper combustion of fuel and to furnish a means of discharging noxious products of combustion high in the air. In other words, the chimney is the lungs of the building. In countries like France and Germany, where waste is a social or commercial crime, no building may be erected without the height and area of the chimney being passed upon by an official board. There is no more important feature in a house, nor one that will cause greater loss than an improperly built chimney, or effect greater saving than a correctly

built one—no matter what kind of heating device or fuel be used. The burning coal must get the correct amount of air it decomposes in order to throw off the proper amount of heat.

Flue Area. The value of a chimney flue depends on its area and height. It is better to have a chimney flue generous in area and height, than to build it too small, for a flue can be choked down by dampers if the draught be too strong, but if it be too small it is always a failure. Improper draughts often may be corrected by a change of coal; large or coarse coal being employed to strengthen the draught and small coal to retard it.

All chimneys should extend above the highest part of the roof and be topped with a shifting cowl that will turn the outlet away from the adverse air currents and thereby promote better draught. A round chimney is a better form than a square one, and a straight flue better than a tapering one. Most chimneys are built of brick, lined with vitrified flues. In constructing a chimney four feet or more in diameter it is cheaper to build it circular with a straight batter on the outside.

Chimneys of great height are not built uniform in size from top to bottom nor with a uniformly varying thickness of wall. Instead, the wall, heaviest at the base, is reduced by a series of steps as it ascends. Large chimneys are built with an outer stack and an inner tube or core, independent of the outer one, with an air space between.

Many engineers extend the inside core, which is designed for fire safety, only to a height of forty or fifty feet. All chimney flues should be ample in size, should start at a point three or four feet below the smoke-pipe entrance, and should have clean-out doors at the bottom for the removal of dust and soot.

The size of flue required may be calculated from the following table:

Total contents of building in cu. ft.	Aver. of direct radiation in sq. ft.	Size of flues in sq. ft.	Diam. of round	Brick flues inside
10,000 to 20,000	200 to 400	8½x8½	8	8x8
25,000 to 50,000	450 to 900	8½x13	10	8x12
60,000 to 100,000	1000 to 1600	13x13	12	12x12
100,000 to 150,000	1600 to 3000	18x18	16	16x16

FUEL.

Fuel values.

The value of fuel is estimated by the number of heat units generated by its combustion. The fuels generally used in heating are composed of carbon, hydrogen and ash, with sometimes small quantities of other substances not materially affecting its value. Anthracite coal, when not freely mixed with ash, produces 14.70 heat units; semi-bituminous coal, 13.70 heat units, and soft coal, from 12 to 13 heat units. Slack, the screenings from coal, burned by means of a grate glower adapted for that purpose, is nearly equal in value of combustion to regular coal, but its percentage of refuse is greater. In reckoning the cost of fuel, it may safely be assumed that the intensity

of the fire will be nearly the same for all kinds of combustibles under like conditions.

PIPING FOR STEAM HEATING PLANT.

Gravity Return Pipe System.

A single return pipe system, utilizing the same pipe for fresh steam and its return to the boiler after condensation, may be cheaper to install, but it has the disadvantage of liability to sudden stoppage because of the steam and water constantly flowing through the same pipe in opposite directions. Substituting for the one-pipe return system a two-pipe gravity system will assure more satisfactory results. In the latter system, steam flows from the boiler through risers and is conveyed to the radiators by suitable steam branches, and the water formed by condensed steam travels back to the boiler by means of a small condensation tube.

The large branches conveying steam to the radiator are placed in a horizontal position, except where the radiator is a considerable distance from the riser. In this case the branch is so inclined that the condensation water within it will flow to the radiator, at which point it is emptied by a small relief pipe into the return branch, to prevent water from accumulating in the radiator. The return pipe, through which all condensation-water is returned to the boiler, is so inclined that all water will flow back by gravity to the boiler, to be again converted into steam. Widely advertised exhaust and vacuum systems, utilizing the

waste steam, are usually costly, as they entail the expense of installing high-priced patented apparatus.

The gravity system just described will require pipe coils or radiators with piping, and piped connections for the steam mains and returns. Genuine wrought-iron pipe endures longest and is by far the best material to employ. There are scores of good connections on the market, but valveless ones are the most desirable. The radiators in common use are made of cast-iron. Double column radiators offer the most exposed heating surface and therefore give the most heat. A light-weight pressed-metal radiator that is easily attached to the wall, and, because of its smooth surface, easily cleaned, has recently come to notice, but sufficient time, however, has not elapsed to test thoroughly its durability.

VENTILATION.

Ventilation as applied to a theatre is the process of supplying an adequate amount of fresh air, warmed or cooled to a proper temperature, in such a manner that the air circulation will be constant and thorough in all parts of the auditorium without the creation of draughts.

Motion and Coolness Necessary

The most important elements of ventilation are motion, coolness and a proper degree of humidity and freshness. Cross ventilation, too, is essential whenever practicable. Air should never be allowed to become stagnant. Vitiated or overheated

air produces drowsiness and dullness of the mental faculties. While our respiratory organs are naturally developed for a life in the open air, advanced civilization has reversed this condition, and we are forced to provide artificial means to correct the evil effects produced by confined areas.

Composition of Air.

The primary object of ventilation is the removal of vitiated air and the substitution of fresh air, and this may be done by natural or mechanical means. The average person consumes in sixteen respirations about a cubic foot of air per minute. This air, at a temperature and humidity of 70 degrees, is composed of about one-fifth oxygen and four-fifths nitrogen. By the process of respiration about one-fifth, or twenty per cent, of the oxygen is lost in the formation of carbonic acid gas. Air thus vitiated and constantly diffused throughout the auditorium is wholly unfit for use.

Were it possible to expel the carbonic acid gas from the auditorium without taking large quantities of otherwise pure air with it the problem of ventilation would be simplified. Because of the rapid diffusion of carbonic acid gas it is necessary, in order to maintain a safe atmospheric value in the auditorium, to flood it with freshened air. Good country air contains about four parts of carbonic acid gas in every 10,000 parts. If a standard of double this amount, say about eight parts of carbonic acid gas in 10,000, could be

maintained in a theatre it would be considered fairly satisfactory. The amount of fresh air required for a theatre is from 1500 to 2000 cubic feet per hour per person.

Manner of Air Supply Important.

The manner in which fresh air is supplied to an auditorium is more important than the amount of supply, as air that traverses a room without reaching the breathing zone is of no practical value. One thousand cubic feet of air well distributed is worth ten times that amount introduced without mixing with the air in the breathing zone.

Few theatre patrons realize that they inhale for about three hours the vitiated exhalations of those seated about them. Many of them are fastidious persons who insist upon drinking filtered water from sanitary cups, and yet they do not object to paying for seats in a germ-laden atmosphere often so foul that it gives off an offensive odor.

Importance of Coolness.

The importance of coolness in temperature is usually as little appreciated as the importance of motion. A water spray to cleanse the air before it is introduced into the auditorium has a beneficial effect on the comfort of theatre patrons, as it serves to extract dust from the air that may irritate the mucous membrane of the respiratory organs, making it susceptible to disease germs. A water spray also increases the amount of humidity in the air, thereby rendering it cooler in the warm summer months. If the water of the spray also be artificially cooled, the air passing

through it will naturally be rendered still cooler.

Change of Air by Infiltration.

In theatres heated by direct radiation. where freshened air is not mechanically supplied, there will be a natural change of air amounting to from one to three complete renewals per hour, because of air infiltration. The quantity of air thus introduced depends largely on the arrangement, character and location of the various openings.

Natural System for Small Houses.

Small theatres may be reasonably well ventilated by means of exhaust ventilators. For additional ventilation in the winter months, a heavy galvanized-iron smoke flue, set like a core in the center of a large chimney, may be employed. The heat rising through the inner core will create an upward draught that will carry off the vitiated air through the outer space surrounding the core as rapidly as it is admitted through outlets from the auditorium. For larger theatres, or for perfect ventilation in smaller ones, any so-called natural system of ventilation is about as good as no system at all.

To understand properly ventilation a knowledge of air circulation is necessary. The effect of heat on air is to increase its volume and diminish its density. Heated or vitiated air rises because of this lessened density, and the simplest method of exhausting such air is by means of mechanical exhaust ventilators installed in the ceiling. There are many forms of these automatic ventilators, but the best in common use is the siphon type. A reliable means also in exhaust

ventilation is a propeller fan encased in a pent-house equipped with a shutter arrangement that closes and overlaps by gravity and opens with the force of the outgoing air current. If it be necessary to employ a duct to convey exhausted air from the blower or fan to the outside air the duct must be equal in diameter to the cross-section of the fan.

As vitiated air is expelled from the auditorium by blowers or fans, a lower pressure is created in the audience hall than that which exists outside, and fresh air will naturally rush in through the doors and fresh air openings to replace what is forced out. While this may be very satisfactory in the summer months, the draughts of cold air would be decidedly uncomfortable in the colder months. This in a measure may be corrected by the introduction of fresh air through a lobby heated by radiators or through fresh air inlets conveniently arranged behind wall radiators.

The Plenum System.

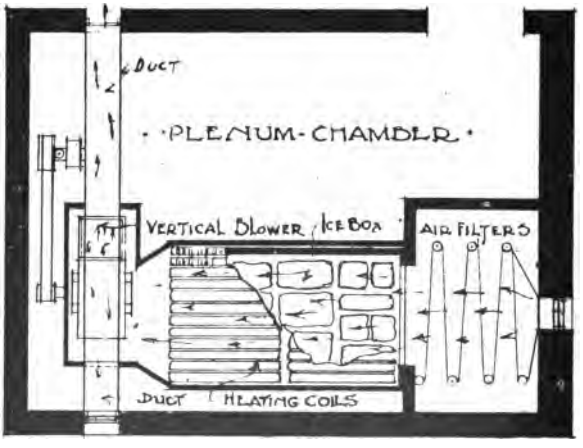
However, the best system for heating and ventilating a theatre is the one termed the plenum or forced-draught system, where the air is taken from the outside into an isolated chamber, there heated or cooled for use, and forced by blower fans into the auditorium.

This chamber may be established either at the top of the auditorium, or in the basement underneath as shown on the heating diagram on Page 145. Its adoption entails a modification of the direct radiation system, combined with other

methods, and provides heating and ventilation simultaneously. It also admits of a mechanical provision for washing the air before it is blown into the auditorium.

Washing the Air.

In such a system the fresh air is drawn from the outer air through a fresh air inlet, composed of louvers or shutters that may be closed by a damper, the opening itself being proportionate in size to that of the fan and the capacity of the theatre. It is better, if possible, to locate this inlet high enough above ground to prevent the outside dust from entering it. The air is then passed by suction through an inclosed dry screen air filter to specially designed radiators in winter, and in summer over an improvised ice box containing large cakes of ice. After being conditioned in this manner it is forced by the same paddlewheel fan into galvanized iron ducts that lead to the audi-



ence hall. In some systems the air is washed by a water spray, heated in winter and cooled in summer.

Preventing Draughts.

To prevent draughts, the air is admitted into the auditorium through tiny covered mushroom outlets installed beneath the seats. There are several large firms that install this air-conditioning outfit complete, but a home-devised arrangement of the description indicated on the before mentioned diagram will answer the same purpose.

To construct and equip this home-made plenum chamber, have a tinsmith make a correctly sized set of galvanized-iron shutters or louvers regulated by an ordinary damper, and install it, covered by a coarse wire netting, in the outer wall at the point indicated in the diagram. Then partition off a space for the installation of an air filter. This consists of two rows of circular wood uprights placed five feet apart and secured to the floor and ceiling. Fasten from top to bottom a tightly stretched chicken wire netting in zig-zag fashion, the purpose of this netting being to support a removable cheesecloth screen of the same size tacked to the circular uprights. These cloth filters should be made of wide strips of cheesecloth sewn together, and are intended to lie tightly against the wire netting. The total area of the filtering space thus exposed should be about ten times the sectional area of the louver inlet. These cloth filter sheets should be removed

at intervals, and thoroughly cleansed and dried before being replaced.

Provide two openings, one above the other, leading into the heating and cooling spaces, with a non-heat-conducting partition between the openings regulated by a damper arrangement. In the upper space place bent cast-iron heating coils made up in sections for the purpose of heating the air by steam, and in the lower space place an ordinary zinc-lined wooden box with a drip pipe draining it. In the winter heat is admitted to any desired number of sections of heating coils, to give a temperature of from 60 to 70 degrees to the filtered air. In the summer the filtered air is passed directly through the lower space over cakes of ice deposited in the ice box Should heat at any time be desired, a portion of the filtered air may be admitted through the space above, heated or not, as the conditions require.

Increasing the Humidity of the Air.

If the humidity of the air is to be increased. as is often desirable in cold weather, the heating engineer should attach to the top of a heater pipe, a long, shallow, open cast-iron receptacle filled with water to moisten the air by evaporation. The alternative is to install a standard humidifier, a costly fixture. At a temperature of 70 degrees humidity at from 40 to 50 degrees is most pleasant.

After the air is properly conditioned and blown into the auditorium through parallel ducts and

the tiny mushroom outlets, it will circulate toward the stage, as shown on the diagram. Reaching the stage opening it will encounter a cooler current supplied for stage heating by direct radiation, and then will curve upward as indicated by the small arrows, and escape through ceiling ventilators or main outlets provided for that purpose.

Regulation of Temperature.

Care should be taken to regulate the temperature introduced so that the air supplied on the stage will form a cooler air blanket than that furnished to the auditorium, thereby insuring a circulation of conditioned air in the audience hall. A proper distribution of mushroom floor vents on the main floor will prevent appreciable draughts, and horizontally-placed vents in the balcony risers will effect the same result in that section. No movement of air introduced into the auditorium should exceed two feet per second to be comfortable to the patrons.

Fig. 1

Fig. 4

Fig. 2

Fig. 5

Fig. 3

Fig. 6

Two Series of Photographs of the Sound and Its Reflections in the New Theatre—Figs. 1 to 3 Before, Figs. 4 to 6 After the Installation of the Canopy in the Ceiling. The Effect of the Canopy in Protecting the Balcony, Foyer Chairs, Boxes, and the Orchestra Chairs Back of Row L is Shown by Comparing Figures 5 and 6 with Figures 1 and 3

By Courtesy of Professor Wallace C. Sabine, Harvard University.

CHAPTER XI.

ACOUSTICS.

FROM the early Greek days down to a comparatively recent time the problem of theatre acoustics has been a perplexing one. Whether or not the Greeks were familiar with the theory and laws of acoustics is a much disputed question. That the Greek theatres had excellent practical acoustics there can be no doubt, but this may have been due to habitual adherence to primitive conditions logically developed into grand form, rather than to any studied application of acoustic laws in their building operations. Certain it is that the Greek theatre had no walls to reflect sound, although many authorities claim that inverted vases of varying size were used instead to intensify sound and increase its volume.

Definite Rules for Acoustics.

Centuries later, Charles Garnier, the architect who built the famous Paris Opera House, when questioned as to the manner in which he obtained such perfect acoustics, replied: "I just trusted to luck." Today, one need not trust to luck. Experts understand certain well-defined rules of acoustics, which, when properly applied, produce uniformly good results.

The audibility of sounds depends upon the loudness, distinctness, and the quality of the effect produced by them. There is always plenty

of sound in any auditorium, but the difficulty is to regulate it. Sound waves radiate from their source in all directions in the manner of a constantly expanding sphere. The tones strike the ceiling and walls solidly and rebound to the auditor within a small fraction of a second. If the auditorium be properly proportioned the reflected sound waves will be received almost simultaneously and in audible unison with the direct sound. As a result, the audience, in what are usually considered the worst seats, hear quite as distinctly as those in the best seats.

Given the size and shape of an auditorium and the materials of which its walls are composed it is now possible to determine accurately beforehand its acoustic value. The acoustic requirements for an opera house and for a regular theatre differ greatly, because of their different formation. The auditorium of an opera house is larger and more open than an ordinary theatre, and has shallow tiers of boxes instead of one or two deep balconies.

Human Voice Carries About 75 Feet.

The problem to be considered here is that of the theatre. As the human voice is capable of projecting distinguishable words only about seventy-five feet without expansion, it is decidedly important that the auditoriumm be confined within that area, and as the downward waves are largely absorbed instead of being reflected, it follows that the height of the ceiling should be about half that distance. Sound naturally loses

in volume with each reflection, diminishing in its intensity until it crosses what scientists term the "threshold of audibility." The rapidity with which sound dies away depends upon the size of the room, its shape, and the materials employed for furnishings, walls and ceiling. In theatres the magnitude and distribution of the audience are also great factors in the propagation or absorption of sound.

The side walls of an auditorium should gradually curve inward toward the proscenium opening, the rear wall following the curved line of the seats. The side walls should be coved at the top to meet the ceiling, and all walls should be made reflective and not absorbent in their quality. Science teaches that sound waves are reflected in exactly the same manner as light rays, the angle of incidence being equal to the angle of reflection, a fact that argues for an avoidance of deep recesses and curves. Irregular lines, sharp turns or abrupt curves, like the deep recesses usually provided for stage boxes, should be avoided. High ceilings, too, are bad, as sound waves carry farther if not hampered by vacant space far above the audience.

Brick or Hollow Tile Walls Best Reflectors.

Experiments covering a number of years, made by Professor Wallace C. Sabine of Harvard University, noted authority on acoustics, demonstrated that walls have either constructive, absorbent or reflective power. Professor Sabine states that plastered brick or hollow tile walls

have proven the best, and are powerful reflectors of sound with very slight absorbing power. In this connection other authorities recommend a plaster composition of hydrated lime, slaked and prepared at the mills. Professor Sabine in discussing the various conditions that offer natural obstruction to the projection of the human voice, gives a comprehensive analysis of the problem in the following manner:

Analysis of the Problem of Acoustics.

"The dissonant (interference) are those places in which sound first uttered is carried up, strikes against the solid bodies above and, reflected, checks as it falls the rise of the succeeding sound. The circumsonant (reverberation) are those in which the voice spreading in all directions is reflected into the middle, where it dissolves, confusing the case endings, and dies away in sounds of indistinct meaning. The resonant (echo) are those in which the voice comes in contact with some solid substance and is reflected, producing an echo and making the case terminations double. The consonant are those in which the voice is supported and strengthened, and reaches the ear in words which are clear and distinct."

Naturally one must lessen or obviate, so far as possible, all of the obstructions described in the first three explanatory phrases above quoted, and strive for the attainment of the conditions enumerated in the last one. The difficulties resulting from interference and reverberation never entered into the acoustic problem in the open

Greek theatre, with its large unobstructed area, nor was echo a serious consideration in these edifices, as there was but one doubling of the case endings. In modern theatres there may be many echoes, each arriving after the direct sound at a different interval of time, and less distinguishable and therefore more disturbing.

Little Theatre Specially Designed for Good Acoustics.

The Little Theatre in New York City, with an auditorium forty-eight feet long and forty-nine feet wide, and with a ceiling twenty-eight feet high in front and twenty-three feet high in the rear, is a fine example of a theatre especially designed to carry the delicate shades of modulated tone with unusual precision. In this theatre, the front walls on either side of the proscenium opening are symmetrically curved and paneled, and the rear walls follow the curved line of the seats. In order still further to reduce reverberation, in each of the side walls are installed three 6 by 13 foot "acoustic felt" panels, and in the rear wall seven similar panels, two being 4 feet 5 inches by 13 feet; two 5 feet by 10 feet; two 2 feet by 4 feet, and one 8 feet by 7 feet. As will be seen by the illustration on Page 167 there are no stage boxes to lessen or destroy sound.

Photographing Sound Waves.

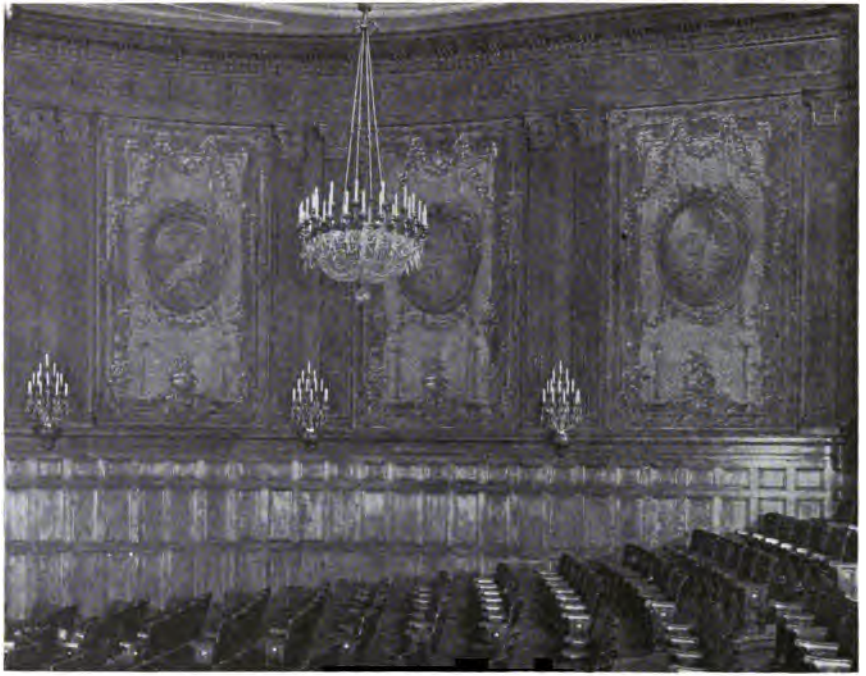
Professor Sabine, in his experiments for remedying the faults of the New Century Theatre, made photographic tests of its sound waves before and after correction. (See illustrations preceding this chapter.) To make these photographs a small model of the theatre as used, the actual

sounds and their echoes being photographed by the Toepler-Boyes-Foley method as air disturbances passing through it.

The reproductions of the original sound waves and the new sound waves after a remedial canopy had been installed in the ceiling visually illustrate the possibility of acoustic correction. This canopy was oval in shape and somewhat larger than the ceiling oval which it replaced, and from which originally hung the central chandelier. It prevented disturbing sound reflections, and Professor Sabine declares that since this correction there are few theatres of its size and capacity in America as free from sound diffraction as this one.

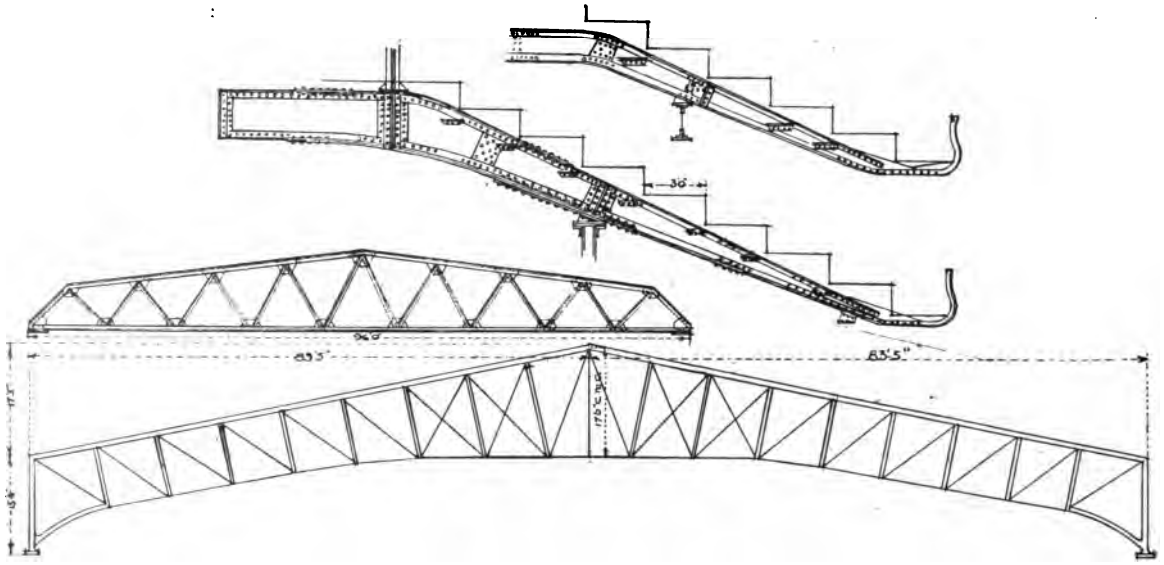
Presence of Audience Improves Acoustics.

The presence of an audience in a theatre usually improves its acoustics. Within the inclosing walls of an auditorium, where the distance traveled is not too great, the voice, rebounding directly from the ceiling oval which it replaced, and from which the ceiling and side walls, arrives almost simultaneously with the direct sound, each spoken syllable being audibly strengthened as a single sound by the resulting "consonance."



Interior View Little Theatre

Harry Creighton Ingalls and F. Burrall Hoffman, Jr., Architects



Examples of Steel Balcony and Roof Trussing

CHAPTER XII.

CONSTRUCTION.

THE correct construction of a theatre is a subject for serious reflection. Safety being the chief essential, only reliable fire-resisting materials should be employed. As the additional cost of constructing a building absolutely fireproof is considerably less than ten per cent and usually not more than six per cent above erecting it non-fireproof, the rational procedure is clearly evident. The saving in fire insurance premiums alone will soon compensate an owner for the comparatively trifling addition to the initial expenditure. Ignorance of the relative cost of structural materials and an inborn but mistaken sense of the cheapness of wood have fostered an erroneous impression that rendering a building absolutely fireproof is expensive.

THE STEEL WORK.

The Steel Framework.

In large or medium sized theatres a steel framework is not only desirable but necessary. With medium steel, the kind used for building construction, a force of 70,000 pounds is needed to break a rod one square inch in cross section, but its elastic limit will not stand a stress of more than 40,000 pounds. In designing steel framework a margin of safety must be allowed that will bring the weight and stress well within the elastic limit.

The services of a competent engineer will be necessary to compute this, but as an economic precaution the author would suggest that after the steel plan has been prepared, it should be checked and revised by an outside engineer on a contingent fee basis; the revising engineer receives as his fee a percentage on any saving effected without sacrificing either the strength or utility of the framework. No risk will be incurred in such a procedure, as the various building laws in this country more than amply provide for safe steel construction.

This steel framework should include uprights and light roof trusses spaced from sixteen feet to twenty feet apart, center to center, with steel floor beams, balcony trusses and supports. Theoretically the shorter the spacing of trusses the less will be the combined weight of truss and purlins per square foot of covered area, but on account of practical limitations in size of materials and the greater cost per pound for manufactured trusses than for beams or purlins the spacing is usually regulated as above stated.

Cantilever Balconies.

Balcony trusses should be supported by an application of the cantilever principle and not by exposed posts or columns. Where the anchoring distance is not sufficiently long for a direct application of this principle a transverse truss supported at both ends by columns imbedded in the walls should be employed to help support the overhang. A series of small-diametered (2 or 3

inch) steel Lally columns encased in the box partitions often may be used as supports for the same purpose.

Lally Columns.

Steel Lally columns are the simplest and cheapest forms of steel construction known. Originally they were covered by a patent that has since expired. They consist of various sized steel tubing (pipes) filled at the factory with a strong mixture of concrete to give added strength. Steel Lally columns withstand intense heat even without extra covering, far better than do ordinary fireproof-covered steel columns.

A Novel Balcony Support.

An ingenious application of the cantilever principle is indicated in the diagram illustrated at the conclusion of this chapter showing the trussing and support of the balcony designed for a theatre with the auditorium reversed. Here the anchorage span between the rear wall and the transverse truss was not long enough to counterbalance the unsupported overhang of the balcony. It therefore became necessary to contrive some form of construction that would support the balcony without dependence upon the masonry walls. This could be done by imbedding and anchoring the balcony upright members in heavy foundations extending over an area equal to that of the structure to be supported. These reinforced foundations, arranged in longitudinal sections six feet wide and six feet deep beneath the basement floor, extend from the rear walls forward to a point immediately below the extreme front

of the balcony, and are spaced an equal distance from the side walls, and sufficiently far apart to receive the superior upright supports, thereby providing for the entire structure a solid base that could not be toppled over by any load that might be placed upon it. Where intermediate Lally columns are used a transverse foundation connecting the two main foundations should be employed.

Substitute for Plentitude of Steel.

In the present condition of the market, with the price of steel more than doubled because of the universal engagement of American steel plants in the manufacture of munitions for the European war, it might be profitable to eliminate all steel uprights and thereby lessen the amount of steel framework, substituting for the uprights at bearing points, brick pilasters, concrete filled hollow tile, or stock Lally columns, and employing only iron beams for floors, with individual detached balcony and roof trusses.

Sliding Roof.

If a sliding roof be adopted the trussed roof framing should provide for a clear opening and covering this opening there should be an independent framework mounted on wheels and divisible in two sections. The construction of these movable sections should be light and arranged with a drip gutter around their base to carry off rain water in inclement weather. The exposed flat ends of each hemisphere of the sliding section and the side walls of the well formed by the permanent roof opening should be ceiled in a

manner to conceal all structural features when the sliding roof is open.

Award Steel Contract First.

Before the excavation begins, the steel contract should be awarded to a reliable firm on a competitive basis, at a ton weight price including erection, with a provision that the total cost shall not exceed an expressed sum. Payment at a weight rate automatically regulates the price in case of additions or omissions. A competent clerk of the works can easily check up the steel as it arrives, and the architect or a good superintendent can supervise and pass upon its construction, thus eliminating all extra profits of a general contractor for a service he does not perform.

"Quantity Basis" Contract Best.

The American Institute of Architects advises the awarding of all building contracts direct to the contractors who are to perform the work, and recommends that all such contracts be made on what is known as a "quantity basis." With such a contract the architect or a competent superintendent employed by the owner can properly safeguard his interests.

This is the manner of contract universally employed throughout Europe, and it is the only one that is just to both owner and contractor. A "quantity basis" contract tends to eliminate so called "extras," which by many contractors are considered their sole source of profit. Under its provision all materials measurable are paid for on a measurement basis at so much per lineal,

square or cubic foot (as the case may be), when satisfactorily completed. Articles not conveniently measurable are paid for at fixed unit prices when installed complete. The Contractor fixes a limit sum not to be exceeded in his contract, and specifies a payment price on a measurement or unit basis.

Avoid "Extras."

Extra work or omissions due to changes in the plans are paid for according to these scheduled quantity prices, thus eliminating so-called "extras." The maximum limit sum therefore can be affected only by gross additions made to the plans or specifications. Persons inexperienced in building are not likely to know that trade unions demand that all extra work required must be performed by the contractor already engaged on the job for that class of work. This is an imperative rule that places the owner at the mercy of the contractor in fixing prices for extra work.

EXCAVATION.

The cheapest and best method is to award excavating contracts to an excavator at a cubic yard price. Separate cubic yard prices should be arranged for rock excavation including blasting and for ordinary excavation, with various prices for carting away or depositing excavated material. By custom and usage all rock or other material excavated belongs to the contractor, unless some contrary stipulation be made. Provision must also be made for depositing enough

excavated earth alongside the wall trenches for a refill upon completion of the walls. For extensive excavations requiring special machinery there are firms who make a specialty of this class of work and have an elaborate equipment for performing it.

FOUNDATION.

The contract for the foundations, all concreting, construction of walls, floors, roof, and all plastering, should be given to a mason builder on the same "quantity basis." The foundations are the most important part of any building, and should be the most substantial. The object of the foundation is to distribute the weight of the structure evenly over the area upon which it stands and thus avoid likelihood of vertical settlements. For this reason the higher the building is to be, the wider and deeper the supports or footings for the foundation must be. If soft or yielding ground is encountered piling should be resorted to in order to carry the weight of the building on a more solid basis.

Footings.

Footings may be of iron, timber, large flat building stones laid directly on the ground or in a bed of concrete, or they may be concrete alone or concrete and stepped-up brickwork. For ordinary purposes good concrete, from one to two feet in thickness, laid in simple trenches dug in firm earth with the sides extending six inches beyond the lines of the foundation wall will an-

swer. These footings should be a foot or two in thickness and sunk below the frost line four or five feet to prevent upheavals from extreme frost.

Slope Footings. Footing courses built on slopes, especially clay slopes, are always liable to slide, and should be formed in steps of as long sections as possible, great care being exercised to secure a perfect bond at the stepping places.

Where the foundation walls rest partly on solid rock and partly on artificial footings great care should be taken to make all footings equally firm with the rock so as to prevent unequal sagging.

Spread Footings. It is often found that compressible soils, even alluvium and soft clay, will bear from one to two tons per square foot with but little settlement, yet under a steady load a uniform settlement will occur. It is often cheaper therefore to employ spread footings over a large area than it is to drive piles. These spread footings may be built either of concrete reinforced with tension rods or with I beams or old railroad iron imbedded in concrete as a base. Spread footings are thicker than ordinary footings and taper inward from the bottom as they ascend. If the ground be spongy or bad it may be necessary to drive piles in addition, in which case an engineer should be consulted.

Piles. All footings should be properly proportioned to the weight they are designed to carry, whether continuous as in a foundation wall or isolated as

when divided into piers. The pressure on the soil per square foot should be equal where the soil is uniform, and if the soil be uneven in its bearing power the footings should be proportioned to the weight properly distributed to insure uniform settlement.

Foundation Walls.

The foundation walls above the footing courses are usually stone, brick or concrete. The thickness of the foundation wall is usually controlled by building laws. For a twelve-inch wall, stone or brick foundation walls should be not less than sixteen inches thick. If the walls of the building are to be of twelve-inch hollow tile as recommended here, a twelve-inch concrete foundation wall will be sufficient, as the concrete will be denser in its composition than the building tile and therefore sufficient for sustaining the lighter walls above.

Unless there is plenty of cheap building stone in the vicinity a concrete foundation wall laid in temporary wood forms will be the cheapest kind. The footings for such a wall will not require any forms, but may be formed by raw concrete dumped into smoothly dug trenches.

An allowance is made by custom in wall measurement for doors, windows and other openings. This rule varies in different localities, being in some communities one-half and in others one-third of the covered area.

EXTERIOR WALLS.

The best known and cheapest fireproof material for outer walls is some form of hollow building tile sufficiently heavy to withstand water shock from a high pressure fire hose. This building tile is made in blocks of varying thickness, but the National Board of Fire Underwriters allow a preferential insurance rate for walls formed twelve inches thick. Blocks of this thickness measure twelve inches by twelve inches by twelve inches, and come plain or scored on one or both sides for the application of stucco or plaster. If this form of block is used it will be better for the sake of appearance to stucco the outer surface of the building either with a cheap rough splatter-dash coat or a smooth troweled surface. Stucco may be rendered any color by the addition of coloring mixtures. The same deductions are made for stucco openings as for wall openings.

Textile. A finished-face tile known as "textile," that requires no stucco, is also made by standard firms in twelve inch by twelve inch by six inch sizes. This block, when laid with rodded or raised mortar joints, presents a much better appearance than brick and costs but a trifle more than the ordinary hollow tile scored for stucco. There is also a tapestry-finished block, made in another form, which may be used at about the same cost.

All of these vitrified clay products are of the same composition as ordinary brick, except that in the process of manufacture they are baked in an additional degree of heat to render them more fire resisting. Building tile is made somewhat larger than brick and has vertical hollow air chambers between its exterior surfaces. The size and lightness of hollow tile makes it easier to lay than brick, and its hollow cells form a dryer and warmer wall in winter and a cooler one in summer.

Whole Blocks Only.

Hollow tile can be laid much quicker than brick and costs about half the price per square foot to lay. If care be taken to specify that only whole blocks be employed, with corner, jamb and lintel blocks where required, a good bricklayer can set 400 blocks or about 400 square feet of wall in a day. Ordinarily much time is lost in patching broken blocks where no such provision is made, and 200 blocks are considered a good day's work. If the blocks be ordered on such specifications the block dealer will charge only for whole blocks, making full deduction for blocks arriving on the premises broken.

Proving their fire-resisting qualities, whole rows of hollow tile building walls stood plumb and uninjured at the recent great Baltimore fire, while brick walls lay crumbled in ruins. So, too, like gaunt sentinels, stood scores of steel Lally columns, later knocked down by men presumably employed in the interest of steel manufacturers.

A Severe Test.

Another striking test of the fire-resisting properties of hollow tile was supplied by former Fire Chief Edward Croker of New York City, a recognized authority on such matters. Mr. Croker erected a fireproof bungalow on Long Island, with hollow tile walls and hollow tile floors, and invited a select coterie of friends to participate in a housewarming. The guests were served with the customary cocktail in a sitting room adjacent to the dining room before being ushered into the latter room for dinner. Once in the dining room, the door between the rooms was closed, and the guests enjoyed undisturbed for over an hour the refreshments proffered. At the conclusion of dinner they were bidden by the host to return to the sitting room to partake of coffee.

Imagine their surprise upon opening the door of the sitting room to find in that room nothing but a mass of charred ruins. While the guests had been dining Mr. Croker's servant, acting upon directions previously given, had gone to the sitting room, saturated its contents thoroughly with kerosene and ignited them. The fire had consumed the entire furnishings of the room and burned itself out while the people in the very next room remained entirely unaware of what had happened.

Hollow Tile as Curtain Walls.

In a steel-framed building the exterior walls are usually merely substantial curtain walls carrying comparatively light loads. In smaller thea-

tres where no steel framing is employed, these hollow tiles may be set with their hollow chambers vertical, one above the other, and at all bearing points grouted or filled with a strong mixture of liquid concrete through these vertical cells to form concrete pilasters. When the concrete has set, monolithic concrete columns extending from the foundation base and capable of supporting great loads are the result. The framework for the floors and balconies, or for any other structural object, may be inserted into and rest upon these concrete uprights.

DIVISION AND PARTITION WALLS.

Interior Walls.

Division walls should be laid with ordinary scored six-inch hollow tile blocks of sufficient strength to withstand the ordinary water pressure from fire hose, and partition walls of six or four inch tile partition blocks, or even thinner blocks made from gypsum. Where long stretches of wall occur, gypsum blocks should be braced by occasional rods or angle irons extending from the floor to the ceiling. Gypsum blocks are somewhat cheaper than tile partition blocks. Very light partitions may be built also of expanded metal or self-centered wire lath, covered with plaster on both sides. All of the above mentioned blocks will permit of the application of plaster direct. Deductions are also made in plastering contracts for openings.

FLOORS.

Good floors may be laid in concrete slabs between steel framing by any of the standard methods, or by pouring liquid gypsum over squares of wire mesh. In each instance they must be top-finished with a hardening compound or with any one of a dozen different floor compositions. The stage floor of a theatre should be covered with comb-grained T. & G. North Carolina pine 7/8 inch by 2½ inch, and all traps should be lined underneath with asbestos boards to make them fireproof.

Avoid Stage Screws in Floors.

The better to preserve the stage floor from wear, scene braces and the like should not be screwed to the floor, but held in place by finishing nails partially driven into the stage through metal hinges attached to the braces. Stage screws permanently mar a finished floor, while finishing nails if not fully driven home may be quickly and easily extracted with the nail pulling clamp of a hammer.

The safe live load for all theatre floors should be as follows:

Lobby and Corridors	100	lbs.	to	the	square	foot.
Stairways	100	"	"	"	"	"
Auditorium	80	"	"	"	"	"
Balcony	80	"	"	"	"	"
Stage	200	"	"	"	"	"
Scene Docks	100	"	"	"	"	"
Property Room	150	"	"	"	"	"
Dressing Rooms	60	"	"	"	"	"
Gridiron	60	"	"	"	"	"
Roof	30	"	"	"	"	"

This table should be consulted before designing steel framing for the various floors and roof.

Cheap Roofs.

Excellent and cheap roof structures can be built of gypsum blocks laid on steel purlins. In the absence of gypsum blocks a four-inch concrete slab may be used. With either material a "Barret specification" roofing may be employed as a covering, or if desired for appearance's sake a shingle roof may be nailed directly to the gypsum blocks.

Stairways.

Emergency stairways inclosed within fireproof walls should be composed of concrete, with steel tread pieces imbedded in the edge of each step. Elaborate open stairways for the lobby or elsewhere should have marble treads and risers with a marble balustrade, or an ornamental iron or bronze railing. If concrete treads be substituted for marble the steps should be covered with plain carpet. Ornamental stairs should be purchased from the manufacturer direct and installed by the mason-builder.

Windows and Doors.

Exterior windows should be of steel, glazed with wire glass. Steel windows come in a variety of shapes and sizes, and whether ordered directly from the manufacturer or not these windows should be installed by the mason-builder at a price agreed upon for each opening. All window sills should be brick, smoothly covered with concrete. The door frames should be formed of steel channels, with or without a trim. It is optional with the owner whether hardwood doors

or steel doors be employed, for there is a wide range in the cost of different grades of doors. All doors and windows should be purchased completely fitted. The great difference between the price of appropriate steel doors and equally well appearing hardwood doors and the slight liability of the latter to fire make the use of hardwood doors most excusable, especially where insurance rates are not materially increased by their use.

Ceilings.

The ceilings of a theatre auditorium should be hung as low as is compatible with the design, in order to secure good acoustics and to provide a material saving in heat. The basis for the ceiling of the audience hall and the horizon device on the stage should be of expanded metal or self-centered wire-lath suspended by heavy wires from the construction trusses. The plaster, whether ornamental or not, should be applied to the expanded metal after it has been fixed in place. The plastering of an ordinary interior and the stuccoing of the exterior constitute part of the rough building and properly belong to the mason-builder.

Contracts for Specialists.

All work demanding special contracts, such as heating, ventilation and plumbing, should be awarded independently to specialists in this class of work rather than to a general contractor, who usually has nothing whatever to do with its installation other than collect an additional profit. The architect or superintendent should be relied upon to check the work. In addition much of

this work should be guaranteed by the individual contractors for a specified time. Unfortunately, trade union rules and customs governing several of the above classes of work prohibit the obtaining of prices on a "quantity basis," and the old undesirable system of "lump" sum bids must be adhered to in such contracts.

Elevators, not generally regarded by law as exits, are frequently installed in theatres. These are put in running order by the various firms who manufacture them, and this contract should be given direct to the maker of the elevator instead of to a general contractor.

Interior Decoration.

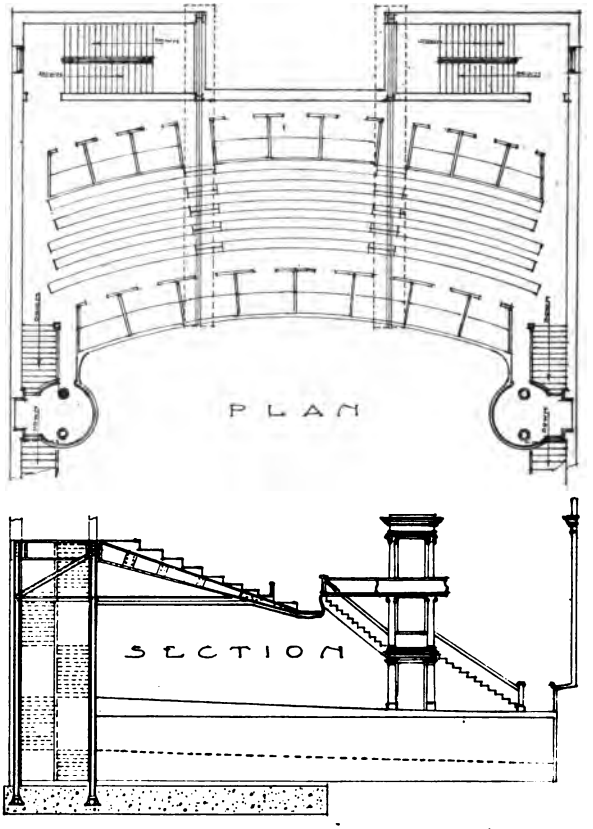
The interior decorating of a fine theatre should be intrusted to a recognized firm of decorators in preference to the architect. An artistic decorator better understands the employment of art in detail than most architects, whose forte is the consideration of art in the mass. The artistic decoration of a theatre should not cost more than $5,000 to $6,000.

The chairs also should be ordered direct from the manufacturers, and should be of low-backed, tip-up variety, with leather or imitation leather upholstery to match the decorations.

Seating.

The space allotted for construction in this volume will not permit of exhaustive details, but the application of the above method of awarding contracts will lessen substantially the cost of the building. Theatre building under prevailing methods costs entirely too much money, and for no

apparent good reason. It is difficult to conceive how a structure composed mainly of an empty shell should cost as much per cubic foot as a commercial building completely fitted with floors and partitions.



Unique Application of Cantilever Principle

CHAPTER XIII.

EXAMPLES OF THEATRE ARCHITECTURE.

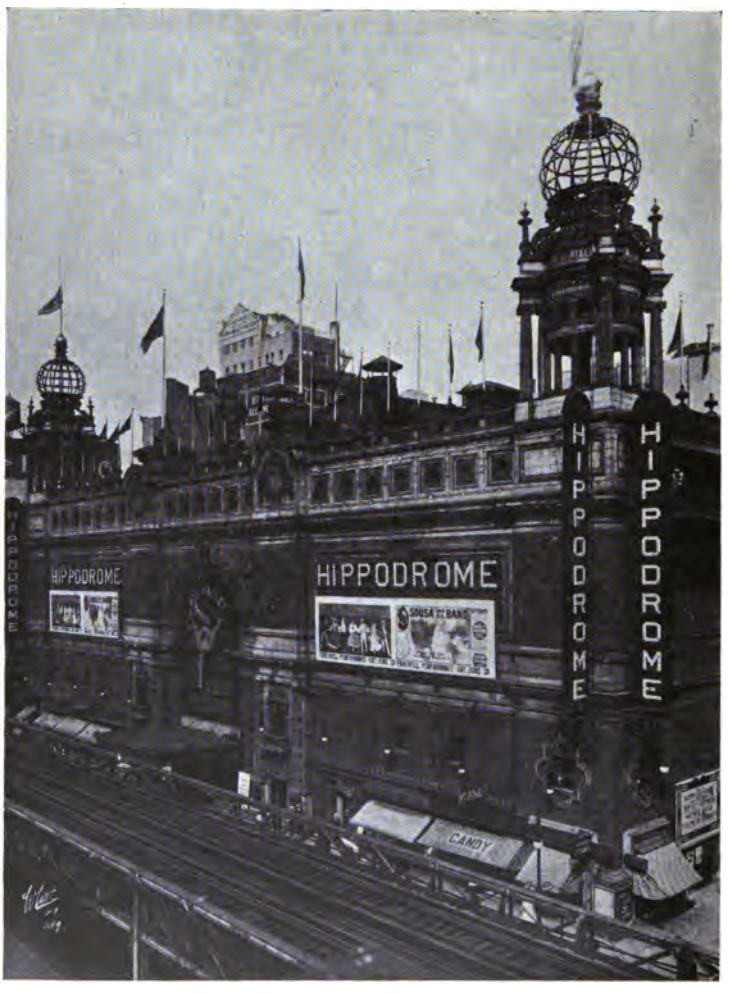
EXISTING AND SUGGESTED MODELS.

THIS chapter will be devoted to the descriptions of the interiors of three existing theatres and of three original models of various types, any and all of which may be adapted for the presentation of motion pictures. In order to differentiate the original models from the existing ones each of the originals will be described as the first visit of an imaginary patron.

NEW YORK HIPPODROME.

Inception of Building.

The first to be described will be the interior of the New York Hippodrome, an existing theatre selected because of its large size and adaptability to the exhibition of motion pictures amid spectacular surroundings. The idea of the Hippodrome had its origin in Blackpool, England, a workmen's watering place near Liverpool. The popular success of a replica of this Blackpool institution that was built in London some years later prompted Fred Thompson of Coney Island fame to construct a similar structure in New York on a much larger scale. He secured the aid of private capital and erected the colossal edifice herein described. It is by far the largest building of its kind in the world, and was designed by J. H. Morgan, of New York. Its con-



Exterior View New York Hippodrome

Interior View of Hippodrome

With Charlotte on Ice

Rapid Construction.

struction was begun July 1, 1904, and five months later it was ready for occupancy. Its front covers the full distance between two ordinary city blocks, 200 feet, and it extends back on the side streets 240 feet. Its cost was $1,750,000.

While the entire building is devoted to a single object, there are, as a matter of fact, two structurally independent portions; the auditorium and the stage, which are connected through the proscenium arch. The auditorium is 160 feet square, and five transverse trusses that span the structure carry the roof. These trusses are supported by four main columns at the corners of a 108 foot rectangle, the two end girders being connected directly to the columns and intermediate trusses by two large longitudinal members.

Color Scheme.

The general color scheme is a Roman red background with all structural features finished in ivory, gold and silver. The entire orchestra, balconies and galleries are carpeted with a fine grade of Royal Wilton covering, woven to order to match the dark crimson decorations, and the wall hangings, draperies, and upholstery are executed in Roman red velvet, enriched with heavy gold and silver embroidery and tassels. Some of these tassels weigh as much as 170 pounds each.

The proscenium opening is 90 feet wide and 45 feet high. In front of the main proscenium is a false arch of terra cotta blocks extending to the ceiling, and between these two prosceniums

there is a secondary gridiron used for suspending trapezes and like paraphernalia.

The stage itself is 200 feet wide and extends back 110 feet to the rear wall. It stretches upward to the roof over 90 feet, its upper section being employed as a fly loft. The semi-circular apron of the stage protrudes 60 feet into the auditorium, and is large enough to contain two regulation circus rings, 40 feet in diameter, in which two distinct performances may be given simultaneously. Underneath this apron and stage is an immense water tank, 14 feet in depth, holding 400,000 gallons, in which aquatic spectacles and all manner of water sports may be shown.

The construction of the stage is original and unique, and its possibilities are exhaustless. It may be lowered, raised and divided throughout at different periods of the performance, and great volumes of water made to flow under it, either hidden or open, as the master hand directs. The whole stage platform is virtually a system of huge elevators supported on mammoth plungers. Two sections of dressing rooms, five stories high, flank either side of the immense stage, behind fireproof walls.

Imposing Entrance.

The imposing entrance, which is graced on both sides by elaborate Corinthian porticos, opens into a reception lobby, liberal in its proportions, wainscoted in marble, with heavily beamed ceilings above. The side walls of the lobby, like those of the interior, are imitation Caen stone relieved

by rich illuminations of ornamental gold and silver. Immense elephants' heads serve as capitals for the marble columns and pilasters.

A National Institution.

The New York Hippodrome and its productions have come to be regarded by the American public as a national institution. For a brief period this colossally proportioned house was devoted to the display of motion pictures on a grand scale, brightened during intermissions by elaborate spectacles and rich stage settings.

ORIGINAL MODEL SUGGESTED FOR A GRAND CENTRAL THEATRE

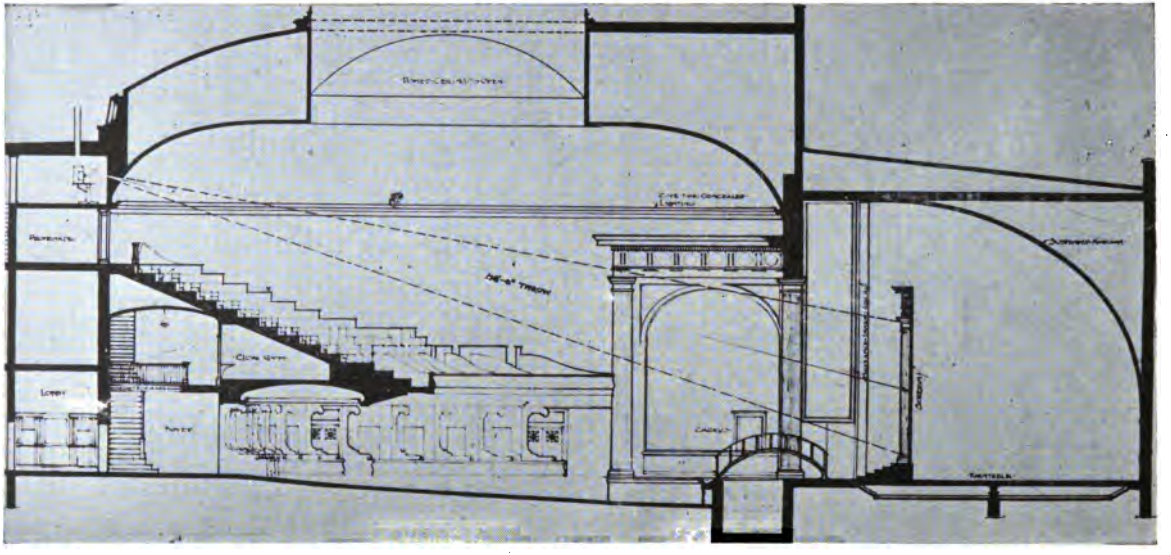
The second theatre to be described is an original model of a large theatre, similar in size to the Hippodrome just described, and intended for the spectacular display of motion pictures. The combination diagram of the floor plans of this building illustrated at the conclusion of this chapter shows the main floor division on the right side of the diagram and the balcony section on the left side.

The Lobby and Foyer.

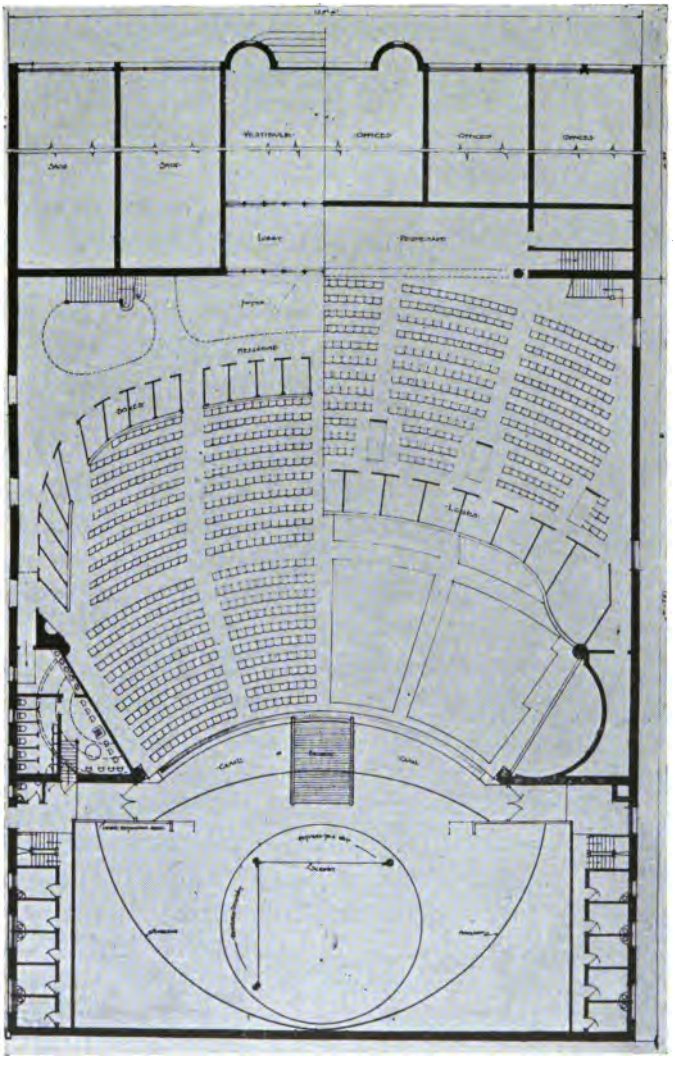
A patron entering this spacious lobby is impressed with the plain paneled marble walls and the simple Greek Doric style of decoration. He purchases his ticket at one of the ticket windows and proceeds past the liveried door attendant into a spacious foyer, comfortably furnished with long upholstered settees that rest against the side walls. Hearing the blast of the orchestral band he approaches one of the five glass paneled doors between the groups of inclosed rear boxes that separate the foyer from the audience hall.

The Auditorium.

These aisle doors lead into five broad passages that divide the great seating space of the main floor into six longitudinal divisions. At the extreme ends of these groups of boxes are also two glass paneled doors connecting with a broad transverse passage. This passage divides the seating space across the middle, leaving ten rows of low-backed chairs on each side of it.



Longitudinal Section of Mode Grand Central Theatre



Combination Floor Plans of Model Grand Central Theatre

These chairs are separated in rows by ample passage space, measuring three feet from back to back. Turning about the patron views the open fronts of the inclosed boxes extending in semi-circular form with flattened sides and rear, from one side exit to the opposite side exit. In the foyer, just outside these side exits, the toilets are arranged underneath the space usually occupied for stage boxes. On one side is an accommodation room for ladies and on the other side a smoking room and a toilet for men.

No Stage Boxes.

The patron proceeds down the aisle and observes on his right instead of a stage box a large terraced semi-circular music stand for the orchestra, with a similar provision for a large chorus on the left side. The domed ceiling and side walls of both are smoothly curved and treated in the familiar manner of sounding-boards for park music stands. Between the arch columns of the outer broad proscenium is an opening some seventy-five feet in width. Before the curtain that divides the stage from the audience there is an open waterway in the space where one usually finds the orchestra. A wide arched bridge spans this waterway midway between the proscenium supporting columns, the front portion being exposed to view. Later, when the curtain rises the entire bridge extending back to the solid stage will be exposed, and underneath this bridge one will see splendid gondolas float, bearing gorgeously costumed gondoliers singing Italian songs.

The Balcony.

Before taking his seat, the visiting spectator takes a sweeping look at the balcony above and behind him. He beholds a deep balcony fringed at the front with open loggias, each seating ten persons. Back of these loggias are twelve rows of the same sort of low-backed chairs as those on the main floor, divided by four aisles that lead up from the passageway behind the loggias to a spacious standing space behind the last row of seats. He notices that each of these aisles split into two passages near the bottom to permit the entrance of a passageway that tunnels its way beneath the main balcony seats to the front row of loggias. He resolves to explore further that section during the intermission.

The Stage

The patron, comfortably seated in his low-backed arm-chair, now watches the great asbestos curtain as it slowly rises, and reveals behind it another proscenium opening, capable of expansion and contraction to any desired size. The curtain of this inner opening splits in the middle and gracefully folds back on both sides as it rises, revealing a stepped platform set a few feet back on the stage and surmounted by a great Roman arch. Upon the rigid white expanse within this arch the pictures are shown to the accompanying strains of appropriate music.

A Pictorial Change of Scene.

Following the first picture comes the closing of the curtains of the inner arch and the singing of the choir accompanied by the music of the band. When the curtains are again separated

the scene on the stage has been completely changed by the simple turning of a large turntable platform fitted in the stage floor. This platform has arranged upon it at right angles to the screen in the Roman arch, another screen framed in a large deep golden molding, similar to that used in art galleries for framing pictures. On either side of it hang corresponding frames, within which are exposed brilliantly lighted groups of live figures representing stationary art scenes. After a brief interval the lights of the living pictures are turned off, and the moving picture in the central frame is shown alone.

No One Enters During the Showing of a Picture.

The spectator notices small groups of people coming in the theatre during the interval, but not a single person enters during the showing of the picture. He is informed afterward that it is a rule of the house to detain latecomers in the spacious foyer until the pause between pictures.

During the long intermission that divides the program the visitor leaves his seat and, going to the rear foyer, climbs one of the broken flights of stairs that lead to the mezzanine floor. Here he observes that this floor resembles a sort of balcony to the rear foyer, and is equipped with cloak rooms and offices between the tunnel passages that pierce the balcony. He traverses one of these and discovers that they are the same tunnels that he saw from below. Upon further investigation he discovers toilets at the ends of the balcony and

behind the spaces reserved for the orchestra and chorus. He also learns that from an entrance outside the auditorium a large projection room situated on the floor above the rear balcony can be reached. This impresses him as an excellent idea in case of a sudden fire in that dangerous zone. If the room be fireproof and there be no openings into the auditorium a fire would burn itself out before being detected by the audience.

A Sliding Roof.

He is also informed that the large dome that adorns the center of the auditorium ceiling is a sliding roof, one hemisphere of which slides to one side while the other half slides to the other side by the pressure of a push-button, exposing a clear view of the sky in pleasant weather. This, too, is a most desirable innovation that has never come to his notice before.

Wandering through the foyer corridor he is struck by the ample means furnished for the comfort of patrons under normal conditions, and the completeness of the safety provision in case of danger. Distributed along the side walls of the foyer, where there are no racks for hanging coats, are settees where the tired may sit, leaving plenty of promenade space for those who prefer to walk. Here at last is a theatre with sufficient lounging space where patrons may wait in comfort for seats to be vacated in the auditorium. In time of fire this same foyer will provide room for the congregation of frightened masses, and its isolation will make it safe from any gas or

smoke created in the theatre proper. Along the side walls are many exit doors that lead direct to the open, and in the interior audience hall it is possible to ventilate quickly the entire room by opening the immense dome that crowns the center of the hall.

Real Indirect Lighting.

The patron does not fail to notice that the entire auditorium, foyer and lobby are illuminated by continuous rows of incandescent lamps hidden behind cornices that reflect their rays from rounded coves surmounting the upper side walls, and look for all the world like a brilliantly painted band instead of a source of light. It is with a feeling of great satisfaction that he leaves the theatre.

THE SCALA THEATRE, LONDON.

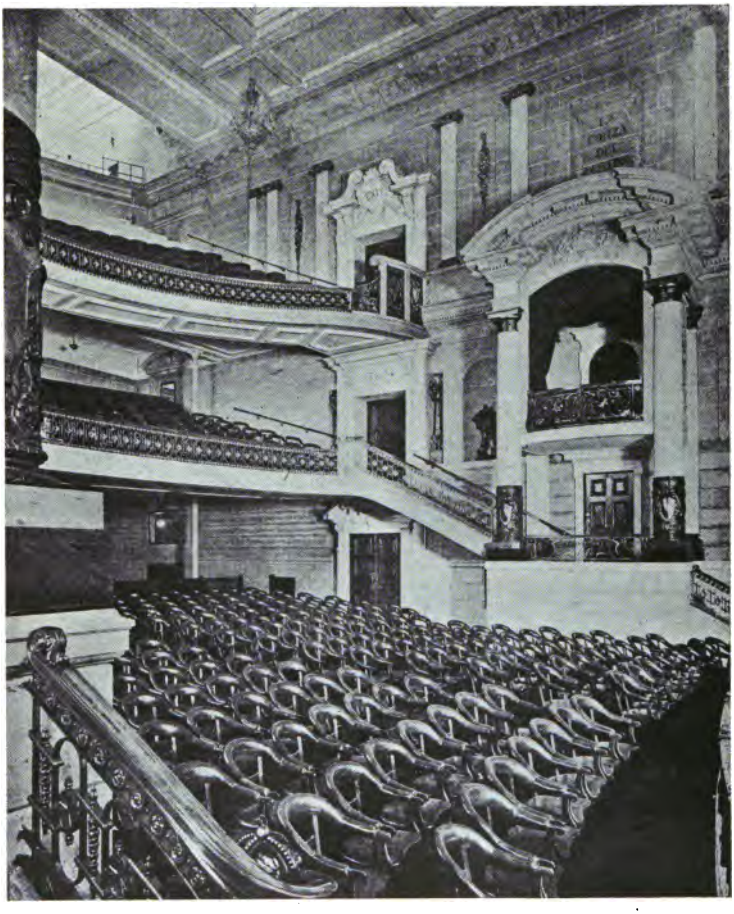
The third will be a brief description of the interior of an existing but rarely used theatre, "The Scala" of London.

This is recognized as the most beautiful theatre in England, and at the time of its erection was probably the finest theatre of its kind in the world. It is the result of the munificence of a wealthy man, and although situated on a little known street in a comporatively poor quarter of London it is built and decorated in perfect taste. In fact, the magnificence of the building is manifest at its very threshold. The interior is of exquisitely designed marble; the seats are luxurious, and the decorations classic and imposing. All about the interior of the auditorium are indications of a distinct advance in the evolution of a modern play-house. Yet this wonderful edifice, boasting of its superior accommodations and noble decorations, stands idle today because of its unwisely chosen location.

Audience Hall.

The side walls are of hewn blocks of unpolished white marble, arranged in severely square panels, bordered with cunningly devised polished marble pilasters of a corresponding color and topped with burnished bronze capitals. As in most London theatres, the stalls or best seats are located below the street level in the front part of the main floor, yet they are readily accessible by open stairways with broken flights of steps

View of Scala Theatre, London, England



Another View Scala Theatre

that descend on either side of the house from the balcony level. The resting platform in the middle of the stairs is surmounted by an open Roman Doric arch, supported on ornamental columns of like design. In the upper niches of the space underneath these arches are installed comfortable state boxes.

Balconies. There is a dress circle (balcony) and a family circle (second balcony) both comfortably furnished with roomy low-backed arm-chairs. The orchestra and pit, too, have chairs of this kind that aid in giving passage space between the rows.

The proscenium opening is a model of simplicity, with its flatly curved top and severely draped front curtain. There is no stage projection, and the orchestra well is buried out of sight beneath the stage front. Stately figures and effective ornaments, with classic column bases and capitals of bronze, help to decorate the marble side walls, the dead white of which is relieved by the warmth of dark rich hangings and draperies.

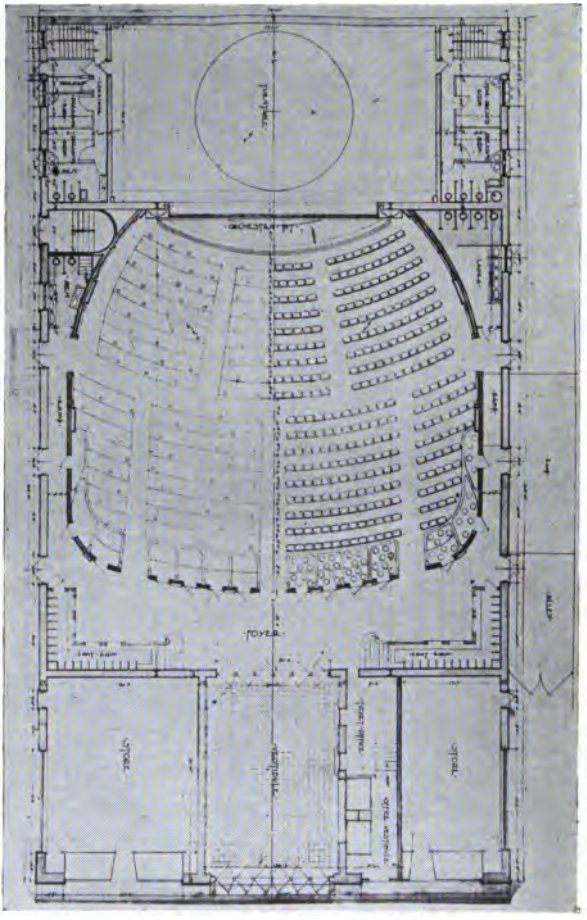
ORIGINAL MODEL FOR A NEIGHBORHOOD THEATRE.

The next interior to be described is an original model of a Neighborhood theatre designed for a superior class of patrons. To assist the imagination in the contemplation of this superior form of theatre we shall employ the same method of pardonable deception as that employed in reciting the features of the large central theatre, except that, because of the social character of the present edifice, the visiting patron shall be accompanied by his wife.

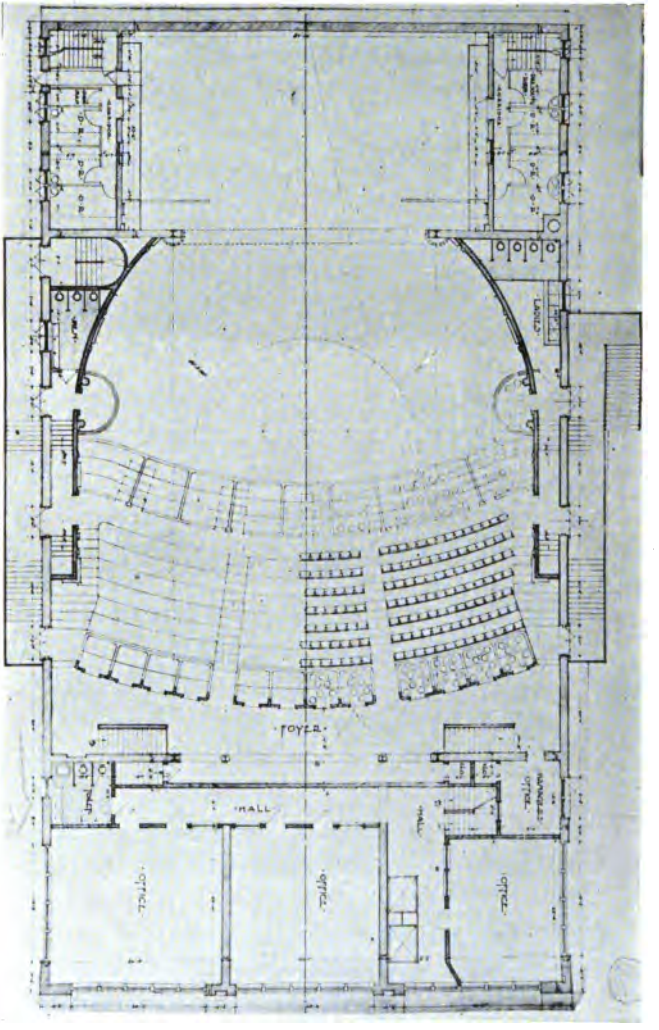
Mr. and Mrs. Pleasanton Visit the New Theatre.

When Mr. Pleasanton comes home after a hard day in his office he may feel in the mood to enjoy a good evening's entertainment, but the necessity of traveling a distance to the theatre is very likely to discourage him from going. When Mrs. Pleasanton, however, tells him of the new theatre so close at hand—only five minutes' walk away—he is glad to accept her suggestion that they visit it.

Approaching the theatre they notice its two long narrow windows, the cathedral glass of which is brilliantly illuminated by indirect lighting. Attracted first by this bright beacon, they both comment on the general beauty and chastity of the exterior design of the theatre and Mr. Pleasanton, ever practical, lauds the owners for their selection of so convenient a site.



Main Floor Plan of Model Neighborhood Theatre



Balcony Floor Plan of Model Neighborhood Theatre

"One never needs to prepare especially for a theatre so near home," he says.

The Foyer And Its Conveniences.

Impressed by the simple decoration of the inviting and spacious lobby, the couple, after procuring their seats at one of the ticket windows that pierce the marble side walls, enter the foyer to be confronted by fresh surprises. Liveried attendants, in apparent profusion, politely relieve them of their wraps, which are deposited in convenient receptacles underneath the stairs to the balcony. Madame's new picture hat is carefully placed in a separate cabinet, and she experiences a feeling of relief as she realizes that there is no danger of its being crushed by persons crowding past her in the cramped space between seats. Mr. Pleasanton also is delighted to learn that there is no extra charge for this much-needed attention.

The Auditorium Seating.

Fortunately they arrive before the performance has begun and are shown directly to their seats. To their utter astonishment the people already seated remain undisturbed while they pass through to their seats. This accomplishment so pleasurably affects Mrs. Pleasanton that she remarks in an undertone to her husband:

"What a comfort it is to feel that we have not disturbed anyone in reaching our seats," and to this her husband dryly retorts: "And what a delightful contemplation to realize that no one will disturb us in crushing past to get in or go out."

Mr. Pleasanton further remarks that this pas-

sage without disturbance is made possible by a trifle wider spacing between the rows of seats and the installation of low-back chairs, adding that such an adoption must bring enough increased patronage to more than offset any small loss in the number of seats.

The Sunken Orchestra Well.

Mrs. Pleasanton signifies her approval and observes that the side walls and ceiling are of hewn stone, to which her husband replies that in his belief they are only plaster imitation of Caen stone, but that nevertheless they afford a feeling of security from fire risk. Mrs. Pleasanton, always a lover of good music, comments on the sweetness of the strains of the overture, which seemingly comes from a distance. Mr. Pleasanton explains that this entrancing effect is produced by submerging the orchestra in a space well beneath the stage apron and front rows of seats, supplementing his explanation with the remark: "Music apparently coming from a distance is alluring. I hate these blatant brass bands that blow their music directly at you in chunks, and in picture houses where they place the band in full view before your very eyes, as if purposely to distract your attention from the stage it is most distressing."

Patrons in a Psychologic Dream.

Before Mrs. Pleasanton can voice her approval the curtain is up and their interest is shifted to the stage. Everything is metamorphosed into what seems to be the temple of a strange god, and the effect upon this captivated couple is such

that they forget entirely their critical faculties. How astute has been the management that has so regulated everything as to render the minds of his patrons sensitive to the slightest impression. Like children listening to an Arabian Nights' tale, they are fascinated by everything they see or hear, so wonderful has been the psychic effect of their surroundings.

A Mirrored View of the Audience.

The act is too quickly over and the curtain falls. A large silvered ball, not unlike the huge mirror balls so popular in European gardens, slowly protrudes into view from the depths of the orchestra well. With suppressed "Ahs" the audience appreciate at once that this bright object gives mirrored reflection of the entire auditorium and all that it contains. Mr. Pleasanton also realizes that this same ball, before being raised, must have served the musical conductor in following the action upon the stage.

No Visible Lamp Fixtures.

With the turning up of the lights both Mr. and Mrs. Pleasanton discover that the auditorium is illuminated by some unseen source of light. There are no fixtures anywhere in view but merely an increased intensity of a bright light band that encircles the room at the cove juncture of the side walls and ceiling. Mr. Pleasanton, a student of technical magazines, explains to his wife that the absence of the usual "spotty" effect is produced by continuous tube lighting.

The mirrored observation ball is lowered and the curtain again rises. Mr. and Mrs. Pleasanton

are at once plunged into an atmosphere of witchery. To them everything in the play pertains to magic. The elderly actors appear youthful, the callous sentimental, the stupid witty, the plain beautiful, and the commonplace romantic. It is a world of illusion in which the events presented are gauged by the mental barometer of the auditor. The low cost of admission, the chastity of decoration, the spacious foyer with its ample provision for coat hanging, the comfortable seating, the concealed music, and the subtle lighting have all done their work well. There is another intermission, the curtain lowers and raises again, the performance is soon over, and the highly pleased couple rise from their seats to take their departure.

The Interior Described.

Facing about, they view the full interior of this magnificent playhouse. Transversely across the lower floor are aisled rows of low comfortable arm chairs from which gayly dressed people are arising. The audience hall is separated from a spacious foyer by groups of inclosed boxes curtained in royal purple. Two similarly draped circular guests' boxes protrude from the side walls above the side foyer doorways, and back of them sweeps a deep broad balcony with open loggias in front and inclosed boxes at the rear. The walls are plain panels of imitation Caen stone, surmounted by a simple ceiling of the same material. with a large canopied dome in the center for ventilation. The junction lines of the walls and

ceiling are adorned by a brilliantly illuminated cove that furnishes reflected light to the whole interior. The floors are carpeted in a solid gray and the dead whiteness of the walls and ceiling is relieved by the warm tones of purple hangings.

The Foyer Furnishings.

Passing through the foyer on their way out the couple wait but a moment to recover their outer garments. Plenty of courteous attendants are there to serve them. This short pause gives them an opportunity to view with admiration the delightful comforts of this broad promenade, with its marble stairways on both sides rising to the balconied mezzanine floor above, underneath which are the coat-hanging and hat-checking conveniences. Against the side walls, between the numerous emergency exits, are long comfortable divans for use during intervals or for patrons waiting for admission until the termination of an act.

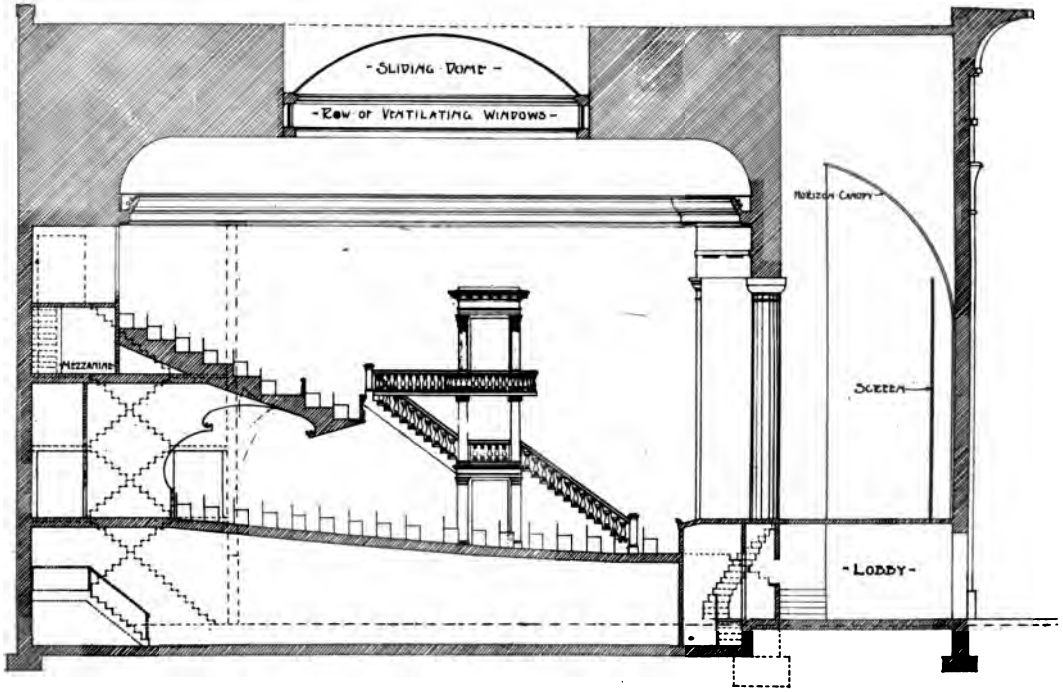
The couple depart deciding to attend this wonderful house again at every weekly change of program.

ORIGINAL MODEL WITH A REVERSED AUDITORIUM.

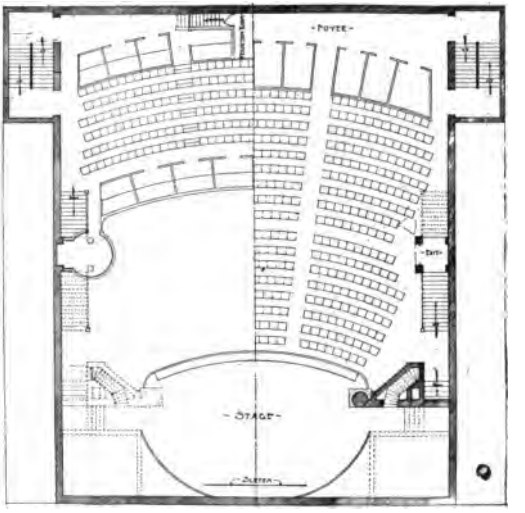
The next form of theatre to be presented is of an original interior design. It is of the same size and general character as the one just described, except that its audience-hall is half a story higher and reversed, with entrances at the front instead of at the rear. The author employed, for the first time, the same idea in constructing the Nollendorf Theatre in Berlin, Germany, said to be, when completed, the finest theatre in the world devoted to motion pictures. He was there confronted by the serious problem of restricted space. The ground had been secured and a theatre of sufficient capacity had to be erected upon it. To accomplish this with practically a ground floor theatre seemed impossible, but necessity became the mother of invention. A theatre was devised with a stage and lobby in the same area, and an entrance that by two short broken flights of stairs delivered patrons into the auditorium half a story above the sidewalk under the impression that they were in a ground floor theatre.

Mr. and Mrs. Pleasanton Visit Another Theatre.

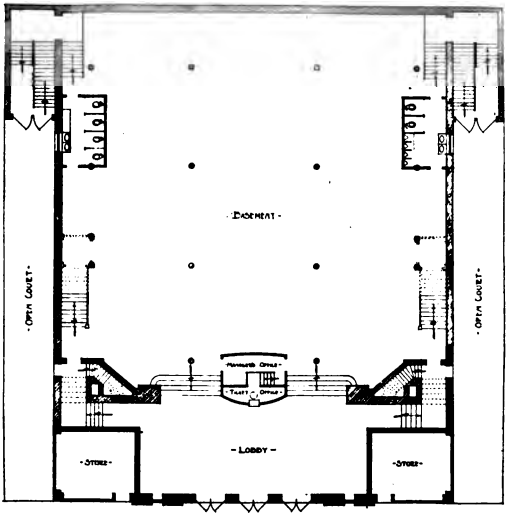
In order to picture more vividly the appearance of this theatre, we shall accompany our friends Mr. and Mrs. Pleasanton on their initial visit to this new house. They approach the broad portals of the proportionately large lobby, where they purchase their tickets.



Longitudinal Section Small Model Photoplayhouse



Combination Floor Plan Small Model Photoplayhouse



Basement Plan Small Model Photoplayhouse

Before proceeding to the audience-hall they descend several steps into a spacious half-basement beneath the auditorium to deposit their wraps and wait for the finish of the picture then being shown in the main hall above. They take their seats in this waiting room at a small table where refreshments are served, and there view the pictured current events being shown on a large screen at the farther end of the small hall. A ringing bell announces that the picture in the hall above has been finished, and they with others who also have been waiting ascend the few stairs that lead to the main auditorium.

Caen Stone Walls and Ceilings.

This grand room has the same side walls and ceiling of Caen stone that distinguish the previous original models, the same illuminated cove extending like a band of light beneath the ceiling, and with the same illuminated ventilating dome for a center.

The Lower Floor Seating.

Transversely across the main floor are seventeen double-aisled rows of low-backed, comfortable arm-chairs, with a wide passage space between that divides them nearly in half. As in the theatres devoted to motion pictures previously visited, the seats are filled with gayly dressed people bathed in a radiance mysteriously reflected downward from the continuous light tubes that lay hidden from view behind the ornamental cornice that crowns the inclosing walls of the auditorium. They are intently listening to the distant strains of an orchestra concealed in a hanging

balcony above the stage opening. Behind these rows of chairs are three groups of inclosed boxes draped in rich hangings, and against the blackness beyond show dimly the outlines of the glass paneled doors that lead to the foyer.

Out of consideration for the attentive gathering and to appreciate more fully the apparent simplicity of an interior decoration endlessly varied in material and style, the couple silently ascend one of the heavily railed broad marble staircases that lead on both sides of the hall to the balcony where are located the best seats in a picture house.

The Balcony.

Upon reaching the balcony, they are impressed by the apparent comfort of the row of open loggias that decorate its front. There is a draped, canopied, circular guest box at each end of the balcony jutting from the wall above the landing platform on the stairs, under which they have passed in making their ascension. Behind the loggias are arranged the same aisled transverse rows of chairs, six in number, and the identical groups of inclosed boxes that give the main floor its appearance of coziness. Here, too, like dim shadows show the glass paneled doors that lead to the balcony foyer beyond.

Emergency Exits.

Taking their seats in one of the open loggias, Mr. and Mrs. Pleasanton view with keen interest the performance, which consists of several reels of an interesting drama. During an intermission of the program the ventilator dome is opened,

affording a clear view of the starry blue sky above. The couple now ascend to the rear foyer of the balcony and take the broad inclosed emergency stairs to the basement. In the rear of the basement, where they have checked their garments, they discover that other stairs lead to this same basement. A flight corresponding to the one they have descended leads to the other side of the rear of the basement, with an opening into an emergency alley on that side of the theatre. Two other stairways with entrances underneath the stairs in the auditorium, that ascend to the balcony, also lead to the fore part of the basement. In the rear of this same basement, adjacent to the emergency stairs, are stationed the two toilets, on one side the men's and on the other side the ladies'.

This Pleased Couple Add This Theatre to Their Visiting List.

Mr. and Mrs. Pleasanton gladly vote this a unique and delightful theatre, as it provides, in addition to comfortable seating, spacious cloak rooms and a waiting room in the basement for patrons, where they may be pleasantly entertained while waiting for the termination of a picture in the main auditorium. The two short broken stairways of a dozen steps all told make it practically a ground floor theatre, and the convenient way of going directly to the lowest point in the balcony is far superior to the usual procedure of reaching the balcony at its highest point in the rear and then walking down again to one's seat.

THE LITTLE THEATRE, NEW YORK.

The next illustrative description will be that of the Little Theatre, New York, erected by Winthrop Ames of Boston, a wealthy disciple of the advanced theatre movement. This house, modeled on the plan of the small intimate theatres of Germany, was built for the express purpose of presenting with artistic precision all the minute gradations of facial expression and the subtle inflections of the voice. It has but one floor and seats but 300 persons.

Exterior.

Crowded closely between two adjoining buildings, its Georgian design is in a manner accentuated. The materials used in the façade are red brick and French limestone. The exterior woodwork is painted pure white with blind green shutters, and the iron work is a dull black.

The vestibule reflects the best Georgian period and displays the artistic conception of the famous Adams brothers.

Auditorium.

The auditorium is illuminated by reflected lights and is constructed on lines totally different from anything previously attempted in America. It is elliptical in shape and devoid of either balcony or stage boxes. The polished birch sidewalls, stained a deep walnut brown, present a succession of flat panels. In these panels have been inserted clever reproductions of the famous Bouche tapestries. The ceiling is in Adams' style, decorated in plain hues which, with reflected light,

Exterior Little Theatre, New York City

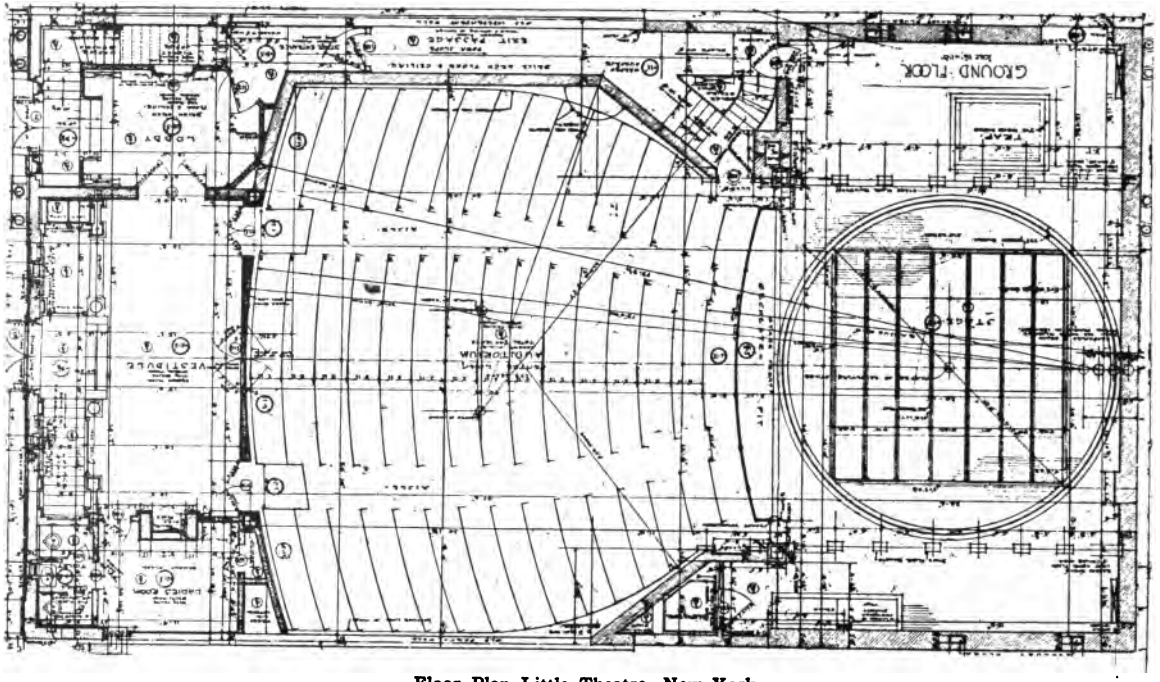
By Courtesy Mr. Winthrop Ames

bring out the brilliant colors of the costumes worn by the women in the audience. The principal illumination is by the indirect rays from two elaborate crystal ceiling candelabra. The curtains are of blue and silver brocade with tapestry borders, and the drop curtain is of Gobelin blue. The carpet is of mouse gray and the dark walnut seats are upholstered in brown leather.

The Stage.

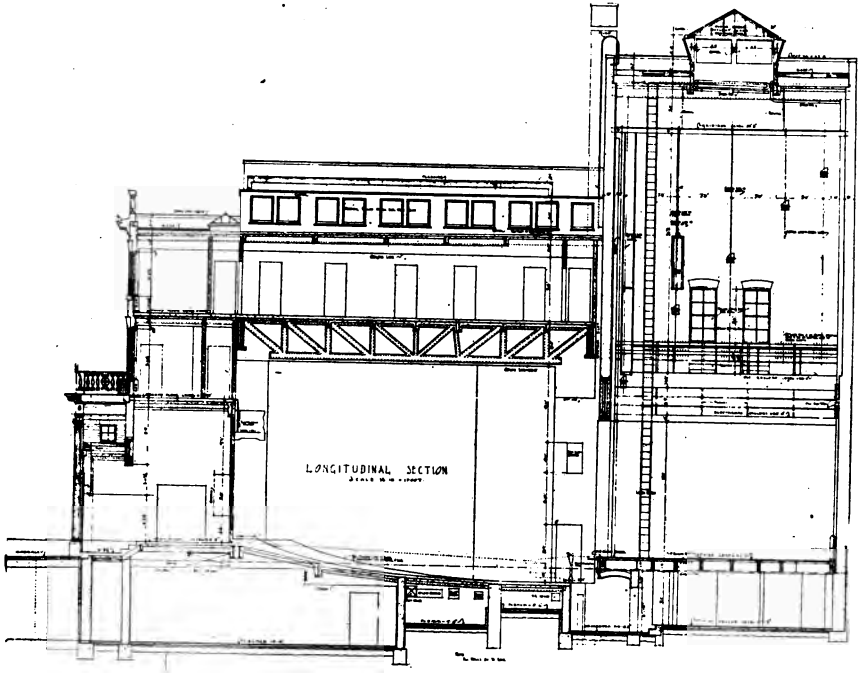
The stage equipment is probably the most modern in this country. It includes a revolving platform of the German turntable type, thirty feet in diameter, which permits of the setting of several scenes at once.

The theatres which have just been described—both those in existence and those whose designs are suggested by the author—are presented as models embodying the principles outlined in this book. They should, and undoubtedly will, have a distinct and beneficial influence upon future American theatre construction.



Floor Plan Little Theatre, New York

Ingalls & Hoffman, Architects



Section of Little Theatre, New York

Ingalls & Hoffman, Architects

APPENDIX.

AN appendix reciting a few of the most necessary regulations may prove of service to the reader. These will include valuable extracts from the electric code of the National Board of Fire Underwriters.

In addition the theatre ordinance purposed by the same authoritive body will be published, together with similar ordinances recently enacted by the Borough of Manhattan (New York City), and the cities of Boston, Philadelphia. Chicago and San Francisco are governed by state laws, with some added local restrictions. The states of Mississippi, Kansas and Ohio also have state laws relative to theatres.

The ordinance of the National Board of Fire Underwriters is not imperative except for the adjustment of insurance rates. Still it was drafted as a suggested model for municipalities, and is hereby given as such.

An Ordinance Regulating the Construction and Equipment of Theatres.

BUILDINGS COVERED.

Every theatre or opera house or other building or parts of building intended to be used for theatrical or operatic purposes or motion picture shows, hereafter erected for the accommodation of more than three hundred persons on all tiers shall be built to comply with the requirements of this ordinance. No building hereafter erected not in accordance with these requirements may be used as a theatre, opera house, or by a motion picture show.

CAPACITY.

The .Building Inspector shall determine the number of persons which every such building may accommodate. This determination shall be based on the actual number of seats and an allowance of 3 square feet per person for all parts of the auditorium or galleries where "standing room" may be provided. By standing room is meant such space in which by law persons may be permitted to stand during any performance. Such measurements are to be exclusive of required aisles, passageways and lobbies. No more than the number so deter-

mined and certified by the Building Inspector shall be allowed in such structure at any one time.

ALTERATIONS.

No building which at the time of the passage of this ordinance is not in actual use for theatrical or operatic purposes within the meaning of this ordinance may be altered or added to for the purpose of converting the same into a theatre, opera house, or for use by a motion picture show, unless when altered or added to it is made in every respect to conform to the requirements of this ordinance.

PRESENT BUILDINGS.

The provisions of this ordinance shall not be construed to mean or be made to apply to theatres, opera houses or motion picture shows, within the meaning of this ordinance now erected or for which plans have heretofore been approved by the Building Inspector.

APPROVALS OF BUILDING INSPECTORS AND FIRE DEPARTMENTS.

No building hereinbefore described shall be opened to the public until the Building Inspector shall have approved the same in writing as conforming to the requirements of this ordinance, nor until the Chief of the Fire Department shall have certified in writing that all appliances for the extinguishing of fire conform to this ordinance and to the special requirements of the Fire Department, and are in a complete and satisfactory working condition.

FIREPROOF BUILDING OVER AUDITORIUM.

Nothing herein contained shall prevent the construction of a thoroughly fireproof building above a fireproof theatre, opera house or motion picture show, providing no part of such fireproof building shall be placed above that portion of any such building which is known as the stage section. The portion containing the theatre, opera house or motion picture show, including all passages, lobbies and other accessories connecting therewith, shall be cut off vertically from such fireproof building by unpierced fire walls of solid masonry not less than 12-inch thick and horizontally by unpierced fireproof floors of strength to safely sustain a live load of 150 pounds per square foot on every superficial foot thereof.

ROOF GARDEN.

A roof garden or open air auditorium (but no other place of public amusement) may be constructed above a fireproof building used for theatrical or operatic purposes or motion picture show built in conformity with the requirements of this ordinance. Such roof garden or open air auditorium shall have not less than 60 per cent of its total floor area open to the sky without a roof, except that a cover of glass and metal skylight construction may be provided, and no part of its seating floor, or space upon which seats might be placed, shall be at greater height than 90 feet above the level of the curb in the street at the main entrance to the building. The total capacity of such roof

garden or open air auditorium shall not exceed 750 persons, figured on the same basis as that provided elsewhere in this ordinance for the calculation of capacity of theatres or opera houses. The construction of such roof garden or open air auditorium shall be fireproof and shall conform in every way to the requirements of this ordinance.

The size of entrances and exits, corridors and stairs shall be 50 per cent greater than the corresponding requirements called for in this ordinance for theatres where the orchestra floor is at or about the street level. If an audience is to be assembled in the theatre, opera house or motion picture show at the same time as in the open air auditorium or roof garden constructed above the same, then the provisions for such entrance and exit herewith required for the latter shall be entirely distinct from and in addition to the provisions for exits and entrances, corridors and staircases required for the structure below.

If any structure is built over the ceiling or roof of any building used for a theatre, opera house or motion picture show, the girders, trusses or other metal members supporting said structure shall be protected against fire by at least 4 inches of fireproof material with special provision to reinforce or support it.

OCCUPANCY RESTRICTED.

No portion of any building hereafter erected or altered, used or intended to be used as a theatre, opera house, or motion picture show, shall be occupied or used for any business dealing in any article or material dangerous to life in the opinion of the Building Inspector.

The before-mentioned restrictions relate not only to that portion of the building which contains the auditorium and the stage, but apply also to the entire structure in conjunction therewith.

WORKSHOPS AND PROPERTY STOREROOMS.

No workshop, storage or general property room shall be allowed in or under the auditorium, above the stage or under the same, or in any of the fly galleries, but such rooms or shops may be located in the rear of, or at the side of the stage, and in such cases they shall be separated from the stage vertically and horizontally by a brick or concrete wall not less than 12 inches in thickness or other equally efficient cut-off, and the openings leading into said portion shall have approved self-closing fire doors on one side of the wall. (See Rules and Requirements of the National Board of Fire Underwriters for Fire Doors.)

No sleeping accommodations shall be allowed in any part of the building communicating with the auditorium or stage.

ENTRANCE VESTIBULES, LOBBIES, ETC.

Interior walls or partitions built of fireproof materials shall separate the auditorium from the entrance vestibule, and from any communicating room or rooms over or under the same, also from any lobbies, corridors, refreshment or other rooms forming part of the theatre; and in all such walls the windows and door frames and all sash and doors shall

be of incombustible construction, and the sash made stationary and glazed with wired glass not less than ¼ inch in thickness and each pane or unit measuring not more than 720 square inches; the doors shall be self-closing.

FLOORS.

All floor surfaces shall be of cement or other incombustible material and no wood boards or sleepers shall be used as a covering over these floors, seat platforms, aisles, steps, landings, passages or stairs.

TRIM.

No combustible doors or trim shall be used in the auditorium, and none of the walls or ceiling shall be covered with wood sheathing, wood wainscoting, or other combustible material, but this shall not preclude the construction of a wood sounding board over orchestra pit when the same extends back of and below the overhang of the stage, provided the said wood sheathing be properly fire stopped by a 12-inch brick wall back of same, and also have a proper fireproof construction directly under the overhang of the stage extending from the brick wall to the apron of stage.

TUNNELS OF CROSS AISLES.

There shall be no more than 11 feet rise, measured vertically in any aisle in any gallery without direct exit, by tunnel or otherwise to a corridor or passage with a free opening to the gallery stairs or other direct discharge to the street. At such elevation of 11 feet or less an intervening or cross aisle leading directly to an exit may be substituted for the tunnel. No such tunnel or cross aisle shall be less than 4 feet wide in the clear.

GALLERY PLATFORMS.

No platforms in galleries formed to receive the seats shall be more than 21 inches in height of riser nor less than 32 inches in width of platform. No such platform shall be nearer than 8 feet from the ceiling.

AISLES—WIDTH OF.

Aisles shall be not less than 3 feet wide at the beginning and all aisles shall be increased in width toward the exits and entrances at the rate of not less than 3 inches to 10 feet of run.

FLOORS AT EXITS.

Floors in auditorium at all exits shall be flush with adjacent inside floors and shall extend for an unbroken width of not less than 4 feet in front of each exit, but no step downward shall be nearer than 1 foot to the door opening.

STEPS IN AISLES.

Steps in aisles shall be the full width of the aisle. No risers shall be more than 9 inches in height, and no tread shall be less than 10 inches in width, and whenever the rise of seat platforms is 4 inches or less, the floor of the aisles shall be made as a gradient. Where

steps are placed in passages they shall be grouped together and shall be clearly lighted. No stool, seat or other obstruction shall be placed in any aisle.

PASSAGES—WIDTH.

The width of passages and hallways shall be computed in the same manner as that hereinafter provided for stairways, but no passage may be less than 5 feet in width.

All passages, hallways, and stairways leading from any balcony or gallery in any direction shall permit of free passage to an exit, without returning.

PASSAGES—AGGREGATE CAPACITY.

The aggregate capacity of the foyers, lobbies, hallways, passages and rooms for the use of the audience, not including aisle space, shall on each tier be sufficient to contain the entire number to be accommodated on said tier, in the ratio of 150 superficial square feet of floor for every hundred persons.

ENTRANCES AND EXITS—DEFINITION.

The term "exit" as used in this section refers to emergency exits only; the term "entrance" refers to all other traffic ingress or egress.

CALCULATIONS.

The combined width of entrances and exits for each tier, likewise their stairs, shall provide 1 foot of width for each 20 persons to be accommodated in that tier.

ENTRANCES.

A common place of entrance may serve for the orchestra floor of the auditorium and the first gallery, provided such entrance and the passages leading thereto are of the width required for the aggregate capacity of these two tiers.

Separate places of entrance shall be provided for each gallery above the first.

EXITS—MINIMUM, AND FIRE DOORS FOR.

From the auditorium at least two exits remote from each other leading into open courts or streets shall be provided in each of both side walls of the auditorium on all tiers. Each exit shall be provided with approved fire doors.

ENTRANCE AND EXIT DOORS—MINIMUM WIDTH.

The minimum width of doorways shall be 5 feet in the clear except exit doorways, which may have a minimum width of 4 feet.

HANGING OF DOORS.

All entrance and exit doors shall open outwardly and be hung in such manner as not to obstruct any part of the required width of a doorway, passage or stairway. The fastenings of these doors shall be such as can readily be opened from the inside at all times without the use of keys or any special knowledge or effort. The use of draw bolts is prohibited. All such doorways shall be entirely unobstructed.

Marking Exits.

Every entrance and exit doorway opening from the auditorium shall have over the same on the auditorium side the word EXIT inscribed in legible letters not less than 6 inches high, or an illuminated sign with letters of the same height. Auditorium entrances and exits shall be numbered with figures not less than 6 inches high.

No mirrors shall be so placed as to give the appearance of a doorway, exit or passage. There shall be no false doors or windows.

Diagram of Exits.

There shall be legibly printed on the program of each performance a separate diagram or plan of every tier. Each such diagram shall occupy a space not less than 15 square inches and shall show distinctly the entrances and exits from each tier and where they lead.

Entrance Corridors.

Where any entrance does not open directly on a street, the corridor or passage connecting it with the street shall be constructed of continuous walls of brick or other fireproof material equally efficient. The roof construction of these corridors must be fireproof and of strength sufficient to safely sustain a live load of 150 pounds per square foot of every superficial foot thereof. The height of such corridors shall be not less than 10 feet throughout. No doors or windows shall be permitted in the side walls or roof.

Stair Landings.

When stairs return directly on themselves, a landing of the full width of both flights, without any steps, shall be provided. The outer line of landings shall be curved to a radius of not less than 2 feet; this provision, however, shall not apply to emergency exit stairs on outside of buildings. Stairs turning at an angle shall have a proper landing. In stairs when two side flights connect with one main flight, the width of the main flight shall be at least equal to the aggregate width of the side flights. No stairway shall ascend to a greater height than 12 feet without a level landing, and the length and width of such landing shall be not less than the width of the stairs; no run of stairs shall consist of less than six risers between platforms.

Stair Rails.

All stairs shall have on both sides strong hand rails. Where stairs are built between walls rails shall be firmly secured to the walls about 3 inches distant therefrom. All rails shall be about 3 feet above the center of the treads. This provision shall also apply to all steps in side aisles of galleries. The width of all stairs must be measured between hand rails. All stairs and landings between stories, when seven (7) feet and over in width, shall be provided with a center hand rail of metal, not less than 2 inches in diameter, placed at a height of about 3 feet above the center of the treads and landings. Such rails shall be

supported on wrought metal or brass standards securely bolted to the treads or risers of stairs, or both. At the head of the flight of stairs terminating at each story, the post or standard shall be at least 6 feet in height, to which the rail shall be secured.

NUMBER OF STEPS AT ENTRANCE.

The entrance opening directly on a street shall not be on a higher level from the sidewalk than four steps of 7¾-inch risers each.

ENTRANCE STAIRS—MINIMUM WIDTH.

Where the number accommodated in a gallery exceeds two hundred, there shall be at least two separate and distinct entrances. No entrance stairs to any tier in the auditorium shall be less than 5 feet wide.

INCLOSURES.

All entrance stairways for the use of the audience (excepting those leading to the first gallery only, which may be open on one side), shall be inclosed with walls of brick or other fireproof materials, in the stories through which they pass. There shall be no communications above the street or court grade in any of said stairway inclosures except the communication from the tier for which the stairway is exclusively intended. No stairway from a gallery shall communicate with the basement or cellar. No door shall open immediately upon a flight of stairs, but a landing at least the width of the door shall be provided between such stairs and such door.

TREADS AND RISERS.

All stairs shall have treads of uniform width and risers of uniform height throughout in each flight. In no case shall the risers in any stairs exceed 7¾ inches in height nor shall the treads, exclusive of nosing, be less than 9½ inches wide. No circular or winding stairs shall be permitted and no winders may be introduced in any stairs.

ENTRANCE STAIRS, STAGE SECTION.

Entrance stairs and passages for the dressing rooms shall be at least 36 inches wide and extend independently to the street or court. No stairs in the stage section shall be less than 30 inches wide. At least 2 independent staircases, with direct exterior outlets at court or street grade, shall be provided for the service of all tiers in the stage section, and shall be located on opposite sides of the stage.

EXIT STAIRS AND BALCONIES.

Exit stairs from each gallery shall be placed in smokeproof and fireproof towers, or in lieu thereof, an approved form of open air stairway may be used. The minimum width of exit stairways shall be 4 feet, except that their width may be reduced fifteen per cent if located in a fireproof and smokeproof tower having no openings except to an outside balcony and to court grade. Exit stairs shall have risers not exceeding 7¾ inches, and treads not less than 9½ inches exclusive of nosing. The stairs for the exits from each tier shall extend to the court

or street grade independently of the stairs or exits from other tiers. Outside balconies shall be at least as wide as the stairways which they serve, but in no case less than 6 feet. No riser shall be nearer than 1 foot to the door opening.

CONSTRUCTION OF BALCONIES AND STAIRS FOR EXITS.

All exit balconies and stairs shall be constructed of steel throughout or of other forms of incombustible construction approved by the Building Inspector. Risers, treads, platforms and balconies must be solid without slats, and the construction shall be of strength sufficient to safely sustain a live load of 100 pounds per square foot. Sheet metal or other suitable solid material shall be provided to a height of not less than 4 feet on the outer side of all these open air stairs, balconies and platforms. All open air stairs, balconies and platforms shall be covered with a metal hood or awning to be constructed in such a manner as shall be approved by the Building Inspector. There shall be no openings in any theatre wall between the outside balconies or stairways and their covers, except the required exits from the tier served by said stairs and balconies. No person of the audience must be obliged to pass alongside of more than one exit doorway after reaching an outside balcony to get to the ground. All exit stairs and balconies shall be kept free of obstructions of every kind including snow and ice.

EXITS FROM STAGE SECTION AND DRESSING ROOMS.

At least two independent exterior exits shall be provided on a level with the stage for the service of the stage and floors below same. These exits shall be at opposite sides of the stage. Each tier of dressing rooms shall have an independent exit leading directly to a fire escape or to a court or street. No ladder fire escapes shall be permitted. The fly galleries shall be provided with adequate means of exit. All exits and fire escapes from the stage section shall be independent of the exits for the audience above the court or street grade. Stairs, if any, leading down from stage level shall be inclosed and protected by fireproof door.

STREET FRONTS AND ENTRANCES THEREON.

Every building used for theatrical or operatic purposes or motion picture shows shall have at least the front or one side wall bordering on a street, and not less than one-half of the openings required for entrance of the audience to the auditorium as hereafter specified shall be provided in such wall or walls.

EMERGENCY COURTS, WHEN REQUIRED.

There shall be reserved for exit purposes an open court or space on the side or sides of the building as follows:

In the case of a plot with streets on front, rear and both sides, or in the case of a double corner plot where both sides of the theatre border on the streets, no courts will be required. On a double corner, single

corner or inside plot when one side only of the building borders on a street, one court will be required located on the opposite side. On an inside plot where only the building front borders on the street, courts will be required on both sides.

In buildings used for motion picture shows and having no stage, the exits and courts above required may be replaced by equivalent exits and courts at the rear if consistent with the adequate distribution of the entire entrance and exit facilities.

COURT WIDTH.

The minimum width of open courts shall be 8 feet when the total capacity is 750 or less; 10 feet when the capacity is between 750 and 1,000; and when the capacity exceeds 1,000 people the width of the courts shall be increased 1 foot for each additional 500 people or fraction thereof in excess of 1,000.

COURT LENGTH.

Said open court or courts shall extend at least from the line of the proscenium wall forward the length of the auditorium to the wall separating the same from the entrance lobby or vestibule. This entire court area shall be open to the sky, except that stairs and smokeproof towers may occupy part of the court space if the required width of exit passageway is not obstructed.

COURT CORRIDORS.

Where said emergency courts do not open directly on a street a separate and distinct corridor or passage shall continue directly to the street, around the building or through such structure as may be or may have been built on the street, but no such passageway shall pass under any portion of the auditorium or stage. Said corridors or passages shall be constructed fireproof all the way to the street in same manner as provided for the construction of corridors for entrances hereinbefore described. The corridor or passage leading from the court to the street shall be at least as wide as the court and there shall be no projections into the passage. The outer openings may be provided with doors or gates opening outward. During the performance these doors or gates shall be kept open; at other times they may be closed and fastened by movable bolts.

ENTRANCES IN COURTS.

If entrances open on emergency courts or corridors the said courts or corridors must be increased in width an amount at least equal to the width of the entrances which they serve.

COURTS AND CORRIDORS KEPT CLEAR.

The courts and corridors or passages shall not be used for storage purposes, nor for any purpose whatsoever except for exit and entrance, and must be kept free and clear during performances

Gradients.

All courts and corridors at points of street entrance or exit must be flush with sidewalk. To overcome any difference of level in and between courts, corridors, lobbies, passages and aisles on the ground floor, gradients shall be employed of not over 1 foot in 10 feet, except that runs of not more than 10 feet in length may be 1 in 8.

Proscenium Wall.

A fire wall built of brick or concrete not less than 12 inches thick at any portion shall separate the auditorium from the stage and shall extend at least 4 feet above the stage roof, or the auditorium roof if the latter be higher. Any windows in the structure above the auditorium which face over roof of stage section when within 100 feet of the stage roof must be protected with fire shutters or wired glass windows in metal sashes and frames. Above the proscenium opening there shall be a girder or other support of sufficient strength to safely carry the load. If a girder be used it shall be protected against fire by at least 4 inches of fireproof material with special provision to reinforce or support it.

Proscenium Curtain.

The proscenium opening shall be provided with a rigid fireproof curtain, built in conformity with the following specifications, or their equivalent in efficiency when approved by the Building Inspector.

The curtain shall have a rigid, rivet-jointed, steel framework. The front or audience side of the frame shall be covered with sheet steel of a thickness not less than No. 16 U. S. gauge. The back shall be covered with vitrified cellular asbestos boards at least 1 inch thick, or other material equally fire resisting. Both coverings shall be securely attached to the framework and the joints properly sealed. The curtain shall be designed to resist a wind pressure of 10 pounds per square foot of surface without flexure sufficient to interfere with its closing.

The thickness of the curtain shall be not less than 3 inches where the width of the proscenium wall opening is 30 feet or less, and curtains for larger openings shall increase in thickness in proportion to the increase in width of opening they cover.

An asbestos roll of a diameter not less than one-half the thickness of the curtain, shall be securely attached to the bottom of the curtain to form a smoke seal between the curtain and the stage.

The curtain shall overlap the proscenium wall opening at least 12 inches at each side of the opening and not less than 2 feet at the top.

The guide members at the sides shall be rolled steel shapes, none of which shall be less than ⅜ inch thick, and shall be of such character as to form a continuous smoke stop from top to bottom, with a clearance of not over ⅜ inch, except that 1 inch shall be allowed

at each edge of curtain to provide for lateral expansion. They shall be installed in such manner that in case of fire on the stage the pressure of heated gases against the curtain will act to close the guide joints tightly. Provision shall be made to prevent the curtain from getting out of the guiding channel into which it shall project at least 2 inches. The proscenium wall shall have an offset at each side of the opening, so located and of such thickness and height as to be suitable for the attachment of the curtain guides.

The wall over the proscenium opening shall be smooth and plumb to approximately the top of the curtain when it is down, and shall then offset at least 4 inches for the rest of its height, thus leaving a bench along the line of the top of the curtain between which a smoke seal shall be formed. Such a seal may conveniently be provided by arranging for the edge of a rolled steel shape attached to the curtain to dip into a trough of sand resting on the bench.

No part of a curtain or any of the curtain guides shall be supported by, or fastened to, any combustible material.

The hoisting apparatus for the curtain shall be designed with a factor of safety of 8.

The points for curtain suspension shall always be an even number, but never less than four. Two of the suspension points shall be located at the extreme ends of the curtain, and the others may be placed at such points as best suit the design, but in no case shall the distance between any two points of support exceed 10 feet.

Half of the cables attached to these points shall lead to one set of counterweights and half to another. The curtain shall be operated by hydraulic or other mechanism approved by the Building Inspector. If hydraulic mechanism is used, the water may be taken from either the house tank or sprinkler tank supply. If from the latter, the supply pipe for curtain mechanism shall be so located in the tank that it cannot reduce the quantity of water below the amount necessary to fulfill the sprinkler requirements.

The device for controlling the curtain shall be simple in design, and capable of convenient operation from both sides of the stage and from the tie galleries.

The drop speed of the curtain shall be uniform and not less than 1 foot per second, but when the curtain is about 2½ feet from the stage it shall automatically slow down so as to settle on the stage without shock. In addition to the regular operating mechanism, there shall be an emergency device which will cut off the power and allow the curtain to drop by gravity. This device shall be so arranged that it can be easily operated by hand from each side of the stage, under the stage, and in the tie galleries. The device shall also be so designed that its operation will be controlled by fusible links located at each of the above named points.

The audience side of the curtain may be decorated with a paint in which no oil is used. No combustible material shall be applied or attached to the curtain.

Drawings for every such curtain shall be submitted to the Building Inspector, and be approved by him before it is erected.

COUNTERWEIGHTS.

Where counterweights are used they shall be suspended at the extreme side or other walls of the stage section, and be inclosed by guards.

OTHER OPENINGS IN PROSCENIUM WALL.

Openings between the stage and auditorium other than the proscenium opening shall not exceed 4 in number, 2 at the approximate stage level and 2 in the musician's pit; the size of any such openings shall not exceed 21 square feet. The openings at stage level shall have an automatic standard fire door on one side of the wall and a self-closing fire door at the other side of the wall, and openings, of any, below the stage shall have a self-closing standard fire door; all of said doors shall be hung so as to be opened from either side of the wall at all times.

STAGE SECTION, OVERHANG OF STAGE.

All that portion of the stage extending from the stage side of the fireproof curtain and from the fireproof wall separating the space under the stage from the auditorium to the outer edge of the apron shall be fireproof. A wood finish floor without air space may be used in front of the curtain and on the stage.

OPENINGS IN EXTERIOR WALLS.

All openings in exterior walls of stage section shall be protected by approved fire doors, shutters or wired glass windows in metal sashes and frames.

ENTRANCE VESTIBULES.

All entrances to the stage from the streets, alleys or open courts must be vestibuled to protect the stage from draughts of air.

FIREPROOF STAGE CONSTRUCTION.

All that portion of the stage which is not movable (excepting that part usually embraced between the proscenium jambs and from proscenium to rear wall) shall be of fireproof construction and designed to safely sustain a live load of not less than 100 pounds per square foot. The non-fireproof portion of stage floor shall be of heavy timbers or steel beam construction with flooring not less than 1¾ inch finished thickness.

FLY AND TIE GALLERIES.

The fly galleries and the tie galleries shall be of fireproof construction designed to safely sustain a live load of 90 pounds per square foot. No wood boards or sleepers shall be used as covering over these floors.

GRIDIRON.

The gridiron or rigging loft shall have a lattice metal floor capable of sustaining a live load of 75 pounds per square foot and be readily accessible by metal stairs.

SCENERY.

All stage scenery, curtains and decorations made of combustible material, and all woodwork on or about the stage, shall be painted or saturated with some non-combustible material, or otherwise rendered safe against fire.

VENTILATION IN STAGE SECTION.

There shall be one or more ventilators constructed of metal or other incombustible material, near the center and above the highest part of the stage of every theatre, opera house or motion picture show, raised above the stage roof, and of a combined sectional area equal to at least 10 per cent of the floor area within the stage walls. The openings in such ventilators shall have an aggregate sectional area at least equal to that required for the ventilators. Detailed drawings showing the construction and operation of the ventilators must be approved by the Building Inspector before installation is begun. The entire equipment shall conform to the following requirements or their equivalent:

The construction of the cover and its operating mechanism shall be massive and the cover shall open by force of gravity sufficient to effectively overcome the effects of neglect, rust, dirt, frost, snow or expansion by heat, twisting or warping of the framework.

Glass if used in ventilators must be protected against falling on the stage. A wire screen if used under the glass must be so placed that if clogged it cannot reduce the required vent area or interfere with the operating mechanism, or obstruct the distribution of water from the automatic sprinklers.

The cover shall be arranged to open instantly after the outbreak of fire by the use of approved automatic fusible links of the thinnest metal practicable; manual control also must be provided by a cord run down to the stage at a point designated by the Building Inspector.

The link and cord must hold the cover closed against a force of at least 30 pounds excess counterweight tending to open the cover. Fusible links shall be placed in the ventilator above the roof line and in at least two other points in each controlling cord. No automatic sprinkler heads shall be placed in the ventilator space above the fusible links. Each ventilator cover shall be operated daily while theatre is in use by one of the cords.

SKYLIGHTS.

If any skylight is placed in a roof, it shall be installed in accordance with the specifications for skylights published by the National Board of Fire Underwriters.

DRESSING ROOMS—LOCATION.

Actors' dressing rooms shall not be placed on or under the stage, or in or under the auditorium. They shall be placed in a separate section provided for that purpose. No dressing room ceiling shall be less than 4 feet, 6 inches above the level of street or court adjoining.

CONSTRUCTION.

The walls separating said section containing the dressing rooms from the stage or auditorium shall be of brick or concrete not less than 8 inches in thickness and each opening therein shall be protected with a self-closing fire door. The partitions dividing the dressing rooms, together with the partitions of every passageway from the same to the stage shall be constructed of approved fireproof material not less than 4 inches in thickness. All doorways in any of said partitions shall be protected by self-closing fire doors. All dressing rooms shall be ventilated by wired glass windows in metal frames to a street or to a court not less than 24 square feet in area.

DRESSING ROOMS—TRIM.

All shelving and cupboards in every dressing room, property room or other storage rooms, shall be of incombustible material.

HEATING APPARATUS—LOCATION.

Steam boilers shall be located outside of the buildings, either under the sidewalk or in an extension, but in no case under or within any portion of the building, and the space allotted to the same shall be inclosed by walls of brick or concrete at least 12 inches thick on all sides, and the ceiling of such space shall be constructed of fireproof materials. Each doorway in said walls connecting with the building shall have an automatic fire door.

FLOOR REGISTERS.

No floor register for heating, ventilating or other purposes shall be permitted in aisles, corridors or passageways.

BLOWERS.

All blowers used to circulate air through heating or ventilating pipes with openings to the auditorium shall be provided with a device to stop the blower automatically in case of fire. Fusible links for this purpose shall be located near the blower, both inside and outside the pipe leading to openings in the auditorium.

RADIATORS.

No coil, radiator or pipe shall be placed so as to obstruct any aisle or passageway. Any exposed radiator or coil shall be guarded.

LIGHTING.

The stage section and every portion of the building devoted to the uses or accommodation of the public, also all passages leading to streets, including the open courts and corridors shall be satisfactorily lighted

during every performance and until the entire audience has left the premises.

KIND.

Only electric light shall be used in the auditorium and stage section, except that gas fixtures having not larger than "one foot" burners may be used in dressing rooms. These shall have soldered to the fixture strong wire guards or screens not less than 10 inches in diameter, so constructed that any material in contact therewith shall be out of reach of the flames.

SUPPLIES.

Where electric current from two separate street mains is available, two separate and distinct services must be installed; one service to be of sufficient capacity to supply current for the entire equipment of the theatre, while the other service must be at least sufficient to supply current for all emergency lights, including the exit lights or signs, and all lights in outside courts, lobbies, stairways, corridors and other portions of the theatre which are normally kept lighted during the performance. Where only one supply from a street main is available the connection used exclusively for emergency lights must be taken from a point on the street side of the main service fuses. When the source of supply is an isolated plant on the same premises an auxiliary service at least sufficient to supply all emergency lights shall be connected with some outside source, or a suitable storage battery within the premises may be considered the equivalent of such service.

EXIT AND ENTRANCE LIGHTS.

Where illuminated signs are not provided there shall be at least one red light over each exit and entrance opening from the auditorium and stage sections.

LIGHTING CONTROLS.

All "emergency lights" shall be controlled by a special switch located in the lobby and accessible only to authorized persons.

STAGE SWITCHBOARD.

The stage switchboard shall have a metal hood over the top, running the full length of the board and fully protecting same from anything falling from above.

AUTOMATIC SPRINKLER EQUIPMENT.

A standard wet-pipe system of approved automatic sprinklers shall be installed throughout the theatre, except in the auditorium, foyers and lobbies. Sprinklers will not be permitted over dynamos and switchboards or above the fusible links immediately under the automatic ventilators over stage.

WATER SUPPLY.

There should be at least two independent water supplies to the automatic sprinklers. The following are approved sources of water supplies:

a. Public Water Works:

The system to give not less than 25 pounds static pressure at all hours of the day at highest line of sprinklers.

b. Pressure Tank:

The tank shall be located approximately at the level of the highest line of sprinklers. The total capacity shall be not less than 5,000 gallons (3,300 gallons of water), and in any event the tank or tanks shall contain sufficient water to supply 25 per cent of the greatest number of sprinklers with an "area" for twenty minutes with an average discharge of twenty gallons per minute per sprinkler.

c. Gravity Tank:

A gravity tank shall contain an available quantity of water sufficient to supply 50 per cent of the number of sprinklers in one "area," to which it gives protection, for 20 minutes, with an average discharge per sprinkler of 20 gallons per minute, but tank shall not be less than 5,000 gallons available capacity.

Elevation of bottom of tank above highest line of sprinklers on system which it supplies shall be not less than 20 feet.

d. Fire Pump:

Fire pump of not less than 500 gallons capacity per minute, and sufficient to supply 50 per cent of the number of sprinklers within an "area" with an average discharge per sprinkler of 20 gallons a minute. The pump is to be so located on premises as to be free from damage by fire or other causes. The pump room shall be readily accessible and easy of safe egress for attendant. Water shall be taken from an approved source, having sufficient capacity to supply pump for not less than 60 minutes, while pump is delivering its rated capacity. A surge tank of not less than 5,000 gallons capacity shall be provided when the supply from the street main is not sufficient. Power to drive pump, whether steam or electricity, shall be constant and properly safeguarded.

FIRE DEPARTMENT CONNECTION.

In addition to two of the above required supplies there shall be an approved Siamese Fire Department connection not less than 4 inches in diameter, placed on the outside of the building at each street front, installed in accordance with the requirements of the Fire Department and with suitable metal plate with raised letters securely attached to the wall near the connection reading "Automatic Sprinklers."

STANDPIPES.

Standpipes shall be provided not less than 4 inches in diameter of wrought iron or galvanized steel, with hose connections, located as follows: One on each side of the stage on each tier, one readily accessible from the property room, the carpenter shop, scenery storage rooms, lobbies and elsewhere as may be required by the Department having jurisdiction. These standpipes, together with fittings and connection,

shall be of such strength as to safely withstand at least 300 pounds water pressure to the square inch when installed and ready for service without leakage at joints, valves or fittings, and shall be provided with hose connections fitted with approved straightway gate valves at hose outlets.

WATER SUPPLIES FOR STANDPIPES.

Said standpipes shall be kept constantly filled with water under pressure, and shall be supplied by at least one of the following sources: Water works, gravity tank, pressure tank, or fire pump.

The capacities and pressure shall be in accordance with the requirements of the department having jurisdiction.

FIRE DEPARTMENT CONNECTION.

In addition to one or more of the above required supplies there shall be an approved siamese Fire Department connection placed on the outside of building at each street front, installed in accordance with the requirements of the Fire Department, with suitable metal plate having raised letters securely attached to wall near the connection, reading "Standpipe."

HOSE.

A sufficient quantity of approved linen hose, 1½ inches in diameter, in 50-foot lengths or enough to cover floor area, shall be kept attached to each hose connection; 25-foot lengths will be permitted in fly galleries. Hose shall be placed on approved racks and fitted with standard couplings at each end. Each line of hose shall be fitted with .short play-pipe, with ⅝-inch smooth bore nozzle and provided with washers at both ends. Spanners shall be located at each hose connection throughout the building.

MISCELLANEOUS FIRE APPLIANCES.

There shall be on each side of the stage two axes, one 20 foot, one 15 foot and one 10 foot hook, as designated by the Fire Department. On each side of the stage, under the stage, on each fly gallery, also in property and other store rooms and in each workshop, there shall be kept in readiness for immediate use one approved 2½-gallon hand chemical fire extinguisher and one 40-gallon cask filled with water, and 6 fire pails; said casks and buckets shall be painted red and lettered "For Fire Purposes Only." There shall also be provided at least three approved 2½-gallon hand chemical fire extinguishers for each tier of the auditorium.

FIRE APPARATUS UNDER CONTROL OF FIRE DEPARTMENT.

All apparatus for the extinguishment of fire shall be installed in accordance with the rules of the Fire Department and be kept at all times in condition satisfactory to and under control of the Fire Department.

BOROUGH OF MANHATTAN.

ARTICLE 24.

MOTION PICTURE THEATRES.

(In Effect March 30, 1915.)

Section 500 PLANS.
501 RESTRICTIONS.
502 CONSTRUCTION.
503 MEANS OF EGRESS.
504 BOOTH FOR PROJECTING-MACHINE AND FILM.
505 APPLICATION TO EXISTING THEATRES.
506 OPEN-AIR MOTION PICTURE THEATRES.

500. *Plans.* Before the erection, construction or alteration of a building or part thereof, to be used as a motion picture theatre, as defined in paragraph 30 of chapter 3 of this ordinance, there must be filed with the appropriate superintendent of buildings complete plans and detailed statement of the specifications therefor, required by paragraph 3 of this chapter. The plans must show clearly and fully the location and width of all aisles, passageways, exits, stairways and fire escapes; the arrangement of seats; the size of floor beams, walls and supports; the location and construction of apparatus; a diagram of the lot or plot upon which the theatre is to be erected or constructed, showing the outlets from all exits, and also such other statements, plans and details as may be required by the superintendent of buildings having jurisdiction.

501. *Restrictions.* No motion picture theatre, as defined aforesaid, shall be constructed in a frame building within the fire limits, nor in a hotel, tenement house or lodging house, nor in a factory or workshop, except where the theatre is separated from the rest of the building by unpierced fire walls and floors, and in no case shall such a theatre be constructed or operated above or below the ground floor of any building.

502. *Construction.* In all motion picture theatres, as defined aforesaid, to be hereafter constructed, the following requirements shall be complied with, namely:

1. *Ceilings.* The ceilings of all theatres and of all rooms used in connection therewith shall be plastered with 3 coats of first-class plaster on wire mesh or metal lath, or covered with ½-inch plaster boards, and plastered or covered with metal. If there be a basement or cellar, the ceiling under the floor of the theatre must be plastered with 3 coats of first class plaster on wire mesh or expanded metal lath, or may be covered with metal on ½-inch plaster boards.

2. *Floor-loads.* The flooring of that portion of the building devoted to the uses or accommodation of the public must be of sufficient strength to bear safely a live load of 90 pounds per square foot.

3. *Galleries and Stairways.* A gallery may be permitted except in a theatre constructed on a lot less than 20 feet in width, but it shall not include more than 25 per cent of the total seating capacity of the theatre. Entrance to and exit from the gallery shall in no case lead to the main floor of the theatre, and the gallery shall be provided with a stairway or stairways equipped with handrails on both sides. Stairways over 7 feet wide shall be provided with centre handrails. The risers of the stairways shall not exceed 7¾ inches, and the treads, excluding nosings, shall not be less than 9½ inches. There shall be no circular or winding stairways. The total width of the stairways shall not be less than 8 feet in the clear where the gallery accommodated 150 people; for every 50 people less than 150, accommodated by the gallery, said width may be reduced 1 foot. Stairways shall be constructed of fireproof material, and such material and the bearing capacity of such stairways shall be approved by the bureau of buildings.

4. *Gradients.* To overcome any difference of level between corridors, lobbies and aisles in a theatre, gradients of not over 1 foot in 10 feet, or steps having a rise not over 8 inches and a width of not less than 10 inches shall be used.

5. *Walls.* If the walls of the theatre contain wooden studs they shall be covered either with expanded metal lath or wire mesh and plastered with three coats of first-class plaster, or with metal on ½-inch plaster boards, and all joints shall be properly filled with mortar.

503. *Means of Egress.* 1. *Aisles.* All aisles in a motion picture theatre or in a gallery thereof must be at least 3 feet in the clear.

2. *Chair Space.* All chairs in such a theatre, except those contained in the boxes, must not be less than 32 inches from back to back and must be firmly secured to the floor; no seat shall have more than 7 seats intervening between it and an aisle, and the space occupied by each person shall be separated from the adjoining space by means of an arm or other suitable device.

3. *Exits.* A building to be erected or to be altered for use as a motion picture theatre must be provided, on the main floor thereof, with at least 2 separate exits, one of which shall be in the front and the other in the rear of the structure and both leading to unobstructed outlets to the street. Where the main floor of the theatre accommodates more than 300 people there shall be at least 3 such exits, the aggregate width in feet of which shall not be less than one-twentieth of the number of persons to be accommodated therein. No exit shall be less than 5 feet in width, and there shall be a main exit, not less than 10 feet in

total width. All exit doors must be fireproof and made to open outwardly, and be so arranged as not to obstruct the required width of exit or court when opened. All doors leading to fire escapes must be not less than 40 inches wide in the clear, and shall be located at the opposite side or end of the gallery from other exit doors.

4. *Exit Passageway to Street.* In any such building, if an unobstructed exit to a street cannot be provided at the rear thereof as herein specified, either an open court or a fireproof passageway or corridor must be provided, extending from the rear exit to the street front, at least 4 feet in the clear for theatres accommodating 100 persons or less; the width to be increased 8 inches for every additional 100 persons to be accommodated. Such passageway or corridor must be constructed of fireproof material and be at least 10 feet high in the clear. The walls forming such passageway or corridor must be at least 8 inches thick, and shall be constructed of brick or other approved fireproof material. If there be a basement, the wall on the auditorium side should either run 1 foot below the cellar bottom, or may be carried in the cellar on iron columns and girders properly fireproofed, according to paragraph 350 of this chapter. The ceiling of such passageway must be constructed as required by paragraph 352 of this chapter. If unobstructed rear exits or exits to a street are provided, they must be of the same total width required for court, passageway or corridor above mentioned. The level of the open court or passageway at the front of the building shall not be greater than 1 step above the level of the sidewalk, and the grade shall not be more than 1 foot in 10, with no perpendicular risers.

5. *Fire Escapes.* Galleries must also be provided with at least one line of fire escapes, leading to an open court, fireproof passage or street without re-entering the same or any other building. If the fire escape leads to a point in the court nearer the street than any exit, there must be a width of not less than 4 feet in the clear between the outer edge of the fire escape and the outer wall of the court. All fire escapes must have balconies, not less than 3 feet 4 inches in width in the clear, and not less than 4 feet 6 inches long, and from said balconies there shall be staircases extending to the ground level, with a rise of not over 7¾ inches and a step of not less than 9½ inches, and the width of the stairs must not be less than 3 feet 4 inches.

504. *Booth for Projecting-Machine and Film.* Apparatus for projecting motion pictures shall be contained in a fireproof booth or inclosure constructed as required by law. The booth in which the picture machine is operated shall be provided with an opening in its roof, or in the upper part of its side walls leading to the outdoor air, and with a vent flue, which shall have a minimum cross-sectional area of 50 square inches and shall be fireproof. When the booth is in use, there shall be a

constant current of air passing outward through said opening or vent flue, at the rate of not less than 30 cubic feet per minute. The requirements of this section shall apply to portable booths and booths in open-air theatres, as well as to motion picture theatres.

505. *Application to Existing Theatres.* All the provisions of this article shall apply to existing places of entertainment where motion pictures are exhibited under common show licenses, in case the seating capacity be increased; and, in case the seating capacity be not increased, all the provisions of this article shall apply, except the provisions of paragraphs 500, 501; subdivisions 1, 3 and 5 of paragraph 502 and subdivisions 3, 4 and 5 of paragraph 503, but the commissioner of licenses shall have power in his discretion to enforce the provisions of subdivisions 3 and 4 of paragraph 503, relating to exits and courts.

An existing place of entertainment seating 300 persons or less, where motion pictures are exhibited in conjunction with any other form of entertainment, must comply, before a reissuance of its license, with the provisions of article 25 of this chapter, relating to theatres seating more than 300 persons. But, if such existing place of entertainment shall discontinue all other form of entertainment except the exhibition of motion pictures, it may be licensed in accordance with the provisions of first paragraph of this section.

506. *Open-Air Motion Picture Theatres.* The seating capacity of each open-air motion picture theatre, as defined in paragraph 30 of chapter 3 of this ordinance, shall be such as shall be prescribed by the commissioner of licenses. All such theatres shall conform to the following requirements:

1. *Aisles.* The number and width of all aisles shall be as prescribed by the commissioner of licenses, but no aisle shall be less than 4 feet wide;

2. *Exits.* At least 2 separate exits, remote from each other, shall be provided, and no exit shall be less than 5 feet in width; for every 25 persons to be accommodated in excess of 300, the total width of exits shall be increased 1 foot. All exits must be indicated by signs and red lights, and doors must open outwardly;

3. *Seats.* Seats must be stationary, with backs 32 inches apart, and so arranged that no seat shall have more than 7 seats intervening between it and an aisle. Chairs must be either securely fastened to a wood or concrete floor, or all chairs in a row must be fastened together, and at least 4 rows must be securely fastened to 1 frame; except that, where refreshments are served, tables and unattached chairs or benches used with them may be permitted;

4. *Floors.* The floor must be constructed either of wood, with sleepers, or concrete; it must extend at least 5 feet from the seats on

all sides; provided, however, that, in the discretion of the commissioner of licenses, a gravel floor may be substituted for wood or concrete.

In addition to the foregoing requirements, the provisions of subdivisions 2 and 4 of paragraph 502 and paragraph 504 of this article shall apply to all open-air motion picture theatres.

ARTICLE 25.

Theatres and Other Places of Amusement.

(In Effect March 30, 1915.)

Section 520 Application of Article.
521 Buildings Must be Approved.
522 Auditorium Walls.
523 Dressing Rooms.
524 Fire-extinguishing Appliances.
525 Heating Plant.
526 Lights.
527 Means of Egress.
528 Partitions and Walls.
529 Proscenium Construction.
530 Protective Curtain.
531 Roof of Auditorium.
532 Seats.
533 Stage.
534 Miscellaneous Requirements.
535 Storage Rooms; Workshops.
536 Use and Occupancy.
537 Jurisdiction of Fire Commissioner.
538 Saving Clause.

520. *Application of Article.* Every theatre or open house or other building intended to be used for theatrical or operatic purposes, or for public entertainment of any kind hereafter erected for the accommodation of more than 300 persons, shall be built to comply with the requirements of this article. No building which, at the time of the passage of this ordinance is not in actual use for theatrical or operatic purposes, and no building hereafter erected not in conformity with the requirements of this section, shall be used for theatrical or operatic purposes, or for public entertainments of any kind, until the same shall have been made to conform to the requirements of this article.

521. *Buildings Must Be Approved.* No building described in the preceding section of this article shall be opened to the public for theatrical or operatic purposes, or for public entertainments of any kind,

until the fire commissioner and the superintendent of buildings shall have approved the same in writing as conforming to the requirements of this article.

522. *Auditorium Walls.* Interior walls built of fireproofing materials shall separate the auditorium from the entrance vestibule, and from any room or rooms over the same, also from lobbies, corridors, refreshment or other rooms.

523. *Dressing Rooms.* Dressing rooms may be placed in the fly galleries, provided that proper exits are secured therefrom to the fire escapes in the open courts, and that the partitions and other matters pertaining to dressing rooms shall conform to the requirements herein contained, but the stairs leading to the same shall be fireproof. All dressing rooms shall have an independent exit leading directly into a court or street, and shall be ventilated by windows in the external walls; and no dressing room shall be below the street level. All windows shall be arranged to open, and none of the windows in outside walls shall have fixed sashes, iron grills or bars.

524. *Fire-Extinguishing Appliances.* In every building described in paragraph 520 of this article there shall be provided:

1. *Hose.* A proper and sufficient quantity of 2½-inch hose, not less than 100 feet in length, fitted with the regulation couplings of the fire department and with nozzles attached thereto, and with hose spanners at each outlet, shall always be kept attached to each hose attachment as the fire commissioner may direct.

2. *Sprinkler System.* A separate and distinct system of automatic sprinklers, with fusible plugs, approved by the superintendet of buildings, supplied with water from a tank located on the roof over the stage and not connected in any manner with the stand pipes, shall be placed at each side of the proscenium opening and on the ceiling or roof over the stage at such intervals as will protect every square foot of stage surface when said sprinklers are in operation. Automatic sprinklers shall also be placed, wherever practicable, in the dressing rooms under the stage and in the carpenter shop, paint rooms, store rooms and property room.

3. *Standpipes.* Standpipes 4 inches in diameter shall be provided with hose attachments on every floor and gallery as follows, namely: One on each side of the auditorium in each tier, also on each side of the stage in each tier, and at least one in the property room and one in the carpenter's shop, if the same be contiguous to the building. All such standpipes shall be kept clear from obstruction. Said standpipes shall be separate and distinct, receiving their supply of water direct from the power pump or pumps, and shall be fitted with the regulation

couplings of the fire department, and shall be kept constantly filled with water by means of an automatic power pump or pumps, of sufficient capacity to supply all the lines of hose when operated simultaneously, and said pump or pumps shall be supplied from the street main and be ready for immediate use at all times during any performance in said building. In addition to the requirements contained in this section, the standpipes shall also conform to the requirements contained in paragraph 581 of this chapter.

4. *Miscellaneous.* There shall also be kept in readiness for immediate use on the stage, at least 4 casks full of water, and 2 buckets to each cask. Said casks and buckets shall be painted red. There shall also be provided hand pumps or other portable fire-extinguishing apparatus and at least 4 axes and two 25-foot hooks, two 15-foot hooks, and two 10-foot hooks on each tier or floor of the stage.

525. *Heating Plant.* Every steam boiler which may be required for heating or other purposes shall be located outside of the building. The space allotted to the same shall be inclosed by walls of masonry on all sides, and the ceiling of such space shall be constructed of fireproof materials. All doorways in the walls of boiler-rooms shall have fireproof doors. No floor register for heating shall be permitted. No coil or radiator shall be placed in any aisle or passageway used as an exit, but all said coils and radiators shall be placed in recesses formed in the wall or partition to receive the same. All supply return or exhaust pipes shall be properly incased and protected where passing through floors or near woodwork.

526. *Lights.* 1. *Adequacy.* Every portion of the building devoted to the uses or accommodation of the public, also all outlets leading to the streets and including the open courts or corridors, shall be well and properly lighted during every performance, and the same shall remain lighted until the entire audience has left the premises. When interior gas lights are not lighted by electricity, other suitable appliances, to be approved by the superintendent of buildings, shall be provided.

2. *Corridors and Passageways.* All gas or electric lights in the halls, corridors, lobby or any other part of said buildings used by the audience, except the auditorium, must be controlled by a separate shut-off, located in the lobby and controlled only in that particular place.

3. *Fireproofing.* No gas or electric light shall be inserted in the walls, woodwork, ceilings, or in any part of the buildings, unless protected by fireproof materials.

4. *Gas connections.* Gas mains supplying the building shall have independent connections for the auditorium and the stage, and provision shall be made for shutting off the gas from the outside of the building.

5. *Nettings.* All suspended or bracket lights surrounded by glass in the auditorium, or in any part of the building devoted to the public shall be provided with proper wire netting underneath. All lights in passages and corridors in said buildings, wherever deemed necessary by the superintendent of buildings, shall be protected with proper wire network.

6. *Stage Lights.* All stage lights shall have strong metal wire guards or screens, not less than 10 inches in diameter, so constructed that any material in contact therewith shall be out of reach of the flames of said stage lights, and must be soldered to the fixture in all cases. The footlights, in addition to the wire network, shall be protected with a strong wire guard and chain, placed not less than 2 feet distant from said footlights, and the trough containing them shall be formed of and surrounded by fireproof materials. All border lights shall be constructed according to the best known methods, subject to the approval of the superintendent of buildings, and shall be suspended for 10 feet by wire rope.

7. *Ventilators.* All ducts or shafts used for conducting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal and made double, with an air space between.

527. *Means of Egress.* 1. *Exits to Streets.* Every theatre accommodating 300 persons shall have at least 2 exits; when accommodating 500 persons, at least 3 such exits shall be provided; these exits not referring to or including the exits to the open court at the side of the theatre. Every such building shall have at least one front on the street, and in such front there shall be suitable means of entrance and exit for the audience, not less than 25 feet in width. The entrance of the main front of the building shall be not on a higher level from the sidewalk than 4 steps, unless approved by the superintendent of buildings. Each exit shall be at least 5 feet in width in the clear and provided with doors of iron or wood; if of wood, the doors shall be constructed as hereinbefore prescribed in this chapter. All of said doors shall open outwardly, and shall be fastened with movable bolts, the bolts to be kept drawn during performances.

2. *Exits to Courts.* In addition to the aforesaid entrances and exits on the street, there shall be reserved for service in case of an emergency an open court or space in the rear and on the side not bordering on the street, where said building is located on a corner lot; and in the rear and on both sides of said building, where there is but one frontage on the street as hereinafter provided. The width of such open court or courts shall be not less than 10 feet where the seating capacity is not over 1,000 people, above 1,000 and not more than 1,800 people 12 feet in width, and above 1,800 people 14 feet width. Said open court or courts shall extend the full length and height of the

building and across on each side and rear thereof where its sides or side does not abut on a street or alley, and shall be of the same width at all points, and exits hereafter specified shall lead into such open courts. From the auditorium opening into the said open courts or on the side street, there shall be not less than 2 exits on each side in each tier from and including the parquet and each gallery. The said open courts and corridors shall not be used for storage purposes, or for any purposes whatsoever, except for exit and entrance from and to the auditorium and stage, and must be kept free and clear during performances.

3. *Doorways of Exits.* Doorways of exit or entrance for the use of the public shall be not less than 5 feet in width, and for every additional 100 persons or portions thereof to be accommodated in excess of 500, an aggregate of 20 inches additional exit width must be allowed. All doors of exit or entrance shall open outwardly and be hung to swing in such a manner as not to become an obstruction in a passage or corridor, and no such doors shall be closed and locked during any representation, or when the building is open to the public.

4. *Foyers, Lobbies and Corridors.* The foyers, lobbies, corridors, passages and rooms for the use of the audience, not including aisles spaced between seats, shall on the first or main floor, where the seating capacity exceeds 500 or more, be at least 16 feet clear, back of the last row of seats and on each balcony or gallery at least 12 feet clear of the last row of seats. The level of said corridors at the front entrance to the building shall be not greater than one step above the level of the sidewalk where they begin at the street entrance. During the performance the doors or gates in the corridors shall be kept open by proper fastenings; at other times they may be closed and fastened by movable bolts or blocks.

5. *Aisles.* All aisles on the respective floors of the auditorium shall be not less than 3 feet wide where they begin, and shall be increased in width toward the exits in a ratio of 1½ inches to 5 running feet.

6. *Gradients.* Gradients or inclined planes shall be employed instead of steps where possible to overcome slight difference of level in or between aisles, corridors and passages. To overcome any difference of level in and between courts, corridors, lobbies, passages and aisles on the ground floor, gradients shall be employed of not over 1 foot in 12 feet, with no perpendicular rises.

7. *Gallery Exits.* Distinct and separate places of exit and entrance shall be provided for each gallery above the first. A common place of exit and entrance may serve for the main floor of the auditorium and the first gallery, provided its capacity be equal to the aggregate capacity of the outlets from the main floor and the said gallery. No passage

leading to any stairway communicating with any entrance or exit shall be less than 4 feet in width in any part thereof. From the auditorium opening into the said open courts or on the side street, there shall be not less than 2 exits on each side in each tier from and including the parquet and each and every gallery.

8. *Staircase to Galleries.* Where the seating capacity is for more than 1,000 people, there shall be at least 2 independent staircases, with direct exterior outlets, provided for each gallery in the auditorium, where there are not more than 2 galleries, and the same shall be located on opposite sides of said galleries. Where there are more than 2 galleries, 1 or more additional staircases shall be provided, the outlets from which shall communicate directly with the principal exit or other exterior outlets. All such staircases shall be of width proportionate to the seating capacity as elsewhere herein prescribed. Where the seating capacity is for 1,000 people, or less, 2 direct lines of staircase only shall be required, located on opposite sides of the galleries, and in both cases shall extend from the sidewalk level to the upper gallery, with outlets from each gallery to each of said staircases. All inside stairways leading to the upper galleries of the auditorium shall be inclosed on both sides with walls of fireproof materials. Stairs leading to the first or lower gallery may be left open on one side in which case they shall be constructed as herein provided for similar stairs leading from the entrance hall to the main floor of the auditorium. But in no case shall stairs leading to any gallery be left open on both sides. No door shall be open immediately upon a flight of stairs, but a landing at least the width of the door shall be provided between such stairs and such door.

9. *Stage Staircases.* At least 2 independent staircases, with direct exterior outlets, shall also be provided for the service of the stage and shall be located on the opposite sides of the same.

10. *Stairways.* All staircases for the use of the audience shall be inclosed with walls of brick, or of fireproof materials approved by the superintendent of buildings, in the stories through which they pass, and the openings to said staircases from each tier shall be of the full width of said staircase. All stairs within the building shall be constructed of fireproof material throughout. Stairs from balconies and galleries shall not communicate with the basement or cellar. All stairs shall have treads of uniform width and risers of uniform height throughout. Stairs from balconies and galleries shall not communicate with the basement or cellar. All stairs shall have treads of uniform width and risers of uniform height throughout in each flight. Stairways serving for the exit of 50 people shall be at least 4 feet wide between railings or between walls, and for every additional 50 people to be accommodated 6 inches must be added to their width. The width of all stairs shall be measured in the clear between hand rails. In no case shall the

risers of any stairs exceed 7½ inches in height, nor shall the treads, exclusive of nosings, be less than 10½ inches wide in straight stairs. No circular or winding stairs for the use of the public shall be permitted. When straight return directly on themselves, a landing of the full width of both flights, without any steps, shall be provided. The outer line of landings shall be curved to a radius of not less than 2 feet to avoid square angles. Stairs turning at an angle shall have a proper landing without winders introduced at said turn. In stairs, when 2 side flights connect with one main flight, no winders shall be introduced, and the width of the main flight shall be at least equal to the aggregate width of the side flights. All stairs shall have proper landings introduced at convenient distances.

11. *Stairway Hand Rails.* All inclosed staircases shall have, on both sides, strong hand rails firmly secured to the wall about 3 inches distant therefrom and about 3 feet above the stairs, but said hand rails shall not run on level platforms and landings where the same is more in length than the width of the stairs. All staircases 8 feet and over in width shall be provided with a centre hand rail of metal, not less than 2 inches in diameter placed at a height of about 3 feet above the center of the treads, and supported on wrought metal or brass standards of sufficient strength, placed not nearer than 4 feet nor more than 6 feet apart, and securely bolted to the treads or risers of stairs, or both, and at the head of each flight of stairs, on each landing, the post or standard shall be at least 6 feet in height, to which the rail shall be secured.

12. *Fire-escapes.* There shall be balconies not less than 6 feet in width in the said open court or courts at each level or tier above the parquet, on each side of the auditorium, of sufficient length to embrace the 2 exits, and from said balconies there shall be staircases extending to the ground level, with a rise of not over 8½ inches to a step and not less than 9 inches tread, exclusive of the nosing. The staircase from the upper balcony to the next below shall be not less than 48 inches in width clear, and from the first balcony to the ground 4 feet in width in the clear where the seating capacity of the auditorium is for 1,000 people or less, 4 feet 6 inches in the clear where above 1,000 and not more than 1,800 people, and 5 feet in the clear where above 1,800 people and not more than 2,500 people, and not over 5 feet 6 inches in the clear where above 2,500 people. All the before-mentioned balconies and staircases shall be constructed of iron throughout, including the floors, and of ample strength to sustain the load to be carried by them, and they shall be covered with a metal hood or awning, to be constructed in such manner as shall be approved by the superintendent of buildings. Where one side of the building borders on the street, there shall be balconies and staircases of like capacity and kind, as before mentioned, carried to the ground.

13. *Diagram of Exits.* A diagram or plan of each tier, gallery or floor, showing distinctly the exits therefrom, each occupying a space not less than 15 square inches, shall be printed in black lines in a legible manner on the programme of the performance. Every exit shall have over the same on the inside the word "Exit" painted in legible letters not less than 8 inches high.

528. *Partitions and Walls.* The partitions in that portion of the building which contains the auditorium, the entrance and vestibule, and every room and passage devoted to the use of the audience shall be constructed of fireproof materials including the furring of outside or other walls. The wall separating the actors' dressing rooms from the stage and the partitions dividing the dressing rooms, together with the partitions of every passageway from the same to the stage, and all other partitions on or about the stage, shall be constructed of fireproof material approved by the superintendent of buildings. All doors in any of said partitions shall be fireproof.

529. *Proscenium Construction.* A fire wall, built of brick shall separate the auditorium from the stage. The same shall extend at least 4 feet above the stage roof, or the auditorium roof, if the latter be the higher, and shall be coped. Above the proscenium opening there shall be an iron girder of sufficient strength to safely support the load above, and the same shall be covered with fireproof materials to protect it from the heat. Should there be constructed an orchestra over the stage, above the proscenium opening, the said orchestra shall be placed on the auditorium side of the proscenium fire wall, and shall be entered only from the auditorium side of said wall. The molded frame around the proscenium opening shall be formed entirely of fireproof materials; if metal be used, the metal shall be filled in solid with non-combustible material and securely anchored to the wall with iron. No doorway or opening through the proscenium wall, from the auditorium, shall be allowed above the level of the first floor, and such first floor openings shall have fireproof doors on each face of the wall, and the doors shall be hung so as to be opened from either side at all times.

530. *Protective Curtain.* The proscenium opening shall be provided with a fireproof metal curtain, or a curtain of asbestos or other fireproof material approved by the superintendent of buildings, sliding at each end with iron grooves, securely fastened to the brick wall and extending into such grooves to a depth not less than 6 inches on each side of the opening. The proscenium curtains shall be placed at least 3 feet distant from the footlights, at the nearest point. Said fireproof curtain shall be raised at the commencement of each performance and lowered at the close thereof, and be operated by approved machinery for that purpose.

531. *Roof of Auditorium.* The roof over the auditorium and the entire main floor of the auditorium and vestibule, also the entire floor of the second story of the front superstructure over the entrance, lobby and corridors, and all galleries and support for the same in the auditorium shall be constructed of iron and steel and fireproof materials, not excluding the use of wood floor boards and necessary sleepers to fasten the same to, but such sleepers shall not mean timbers of support, and the space between the sleepers, excepting a portion under the stepping in the galleries, which shall be properly fire-stopped, shall be solidly filled with incombustible material up to under side of the floor boards.

532. *Seats.* All seats in the auditorium, excepting those contained in boxes, shall be not less than 32 inches from back to back, measured in a horizontal direction, and firmly secured to the floor. No seat in the auditorium shall have more than 6 seats intervening between it and an aisle on either side. No stool or seat shall be placed in any aisle. All platforms in galleries formed to receive the seats shall not be more than 21 inches in height of riser, nor less than 32 inches in width of platform.

533. *Stage.* 1. *Construction.* All that portion of the stage not comprised in the working of scenery, traps and other mechanical apparatus for the presentation of a scene, usually equal to the width of the proscenium opening, shall be built of iron or steel beams filled in between with fireproof material, and all girders for the support of said beams shall be of wrought iron or rolled steel. The fly galleries entire, including pin-rails, shall be constructed of iron or steel, and the floors of said galleries shall be composed of iron or steel beams, filled with fireproof materials, and no wood boards or sleepers shall be used as covering over beams but the said floors shall be entirely fireproof. The rigging loft shall be fireproof.

2. *Skylights.* There shall be provided over the stage metal skylights of an area or combined area of at least ⅛ the area of said stage, fitted up with sliding sash and glazed with double thick sheet glass not exceeding 1–12 of an inch thick, and each pane thereof measuring not less than 300 square inches and the whole of which skylight shall be so constructed as to open instantly on the cutting or burning of a hempen cord, which shall be arranged to hold said skylights closed, or some other equally simply approved device for opening them may be provided. Immediately underneath the glass of said skylights there shall be wire netting, but wire glass shall not be used in lieu of this requirement.

3. *Scenery and Fittings.* All stage scenery, curtains and decorations made of combustible material, and all woodwork on or about the stage, shall be painted or saturated with some non-combustible material or

otherwise rendered safe against fire, and the finishing coats of paint applied to all woodwork through the entire building shall be of such kind as will resist fire to the satisfaction of the superintendent of buildings having jurisdiction.

534. *Miscellaneous Requirements.* 1. *Ceilings.* The ceiling under each gallery shall be entirely formed of fireproof materials. The ceiling of the auditorium shall be formed of fireproof materials.

2. *Ceiling Coverings.* None of the walls or ceilings shall be covered with wood sheathing, canvas or any combustible material. But this shall not exclude the use of wood wainscoting to a height not to exceed 6 feet, which shall be filled in solid between the wainscoting and the wall with fireproof materials.

3. *Fronts of Galleries.* The fronts of each gallery shall be formed of fireproof materials, except the capping, which may be made of wood.

4. *Lathing.* All lathing, whenever used, shall be of wire or other metal.

5. *Shelving and Cupboards.* All shelving and cupboards in each and every dressing room, property room or other storage rooms, shall be constructed of metal, slate or some fireproof material.

535. *Storage Rooms; Workshops.* No workshop, storage or general property room shall be allowed above the auditorium or stage, or under the same or in any of the fly galleries. All of said rooms or shops may be located in the rear or at the side of the stage, but in such cases they shall be separated from the stage by a brick wall, and the openings leading into said portions shall have fireproof doors on each side of the openings, hung to iron eyes built into the wall.

536. *Use and Occupancy.* 1. *Restrictions.* No portion of any building hereafter erected or altered, used or intended to be used for theatrical or other purposes as in this section specified, shall be occupied or used as a hotel, boarding or lodging house, factory workshop or manufactory, or for storage purposes, except as may be hereafter specially provided for. This restriction relates not only to that portion of the building which contains the auditorium and the stage, but applies also to the entire structure in conjunction therewith. No store or room contained in the building, or the offices, stores or apartments adjoining, as aforesaid, shall be let or used for carrying on any business, dealing in articles designated as specially hazardous in the classification of the New York Board of Fire Underwriters, or for manufacturing purposes. No lodging accommodations shall be allowed in any part of the building communicating with the auditorium. When located on a corner lot, that portion of the premises bordering on the side street and not required for the uses of the theatre may, if such portion be

not more than 25 feet in width, be used for offices, stores or apartments, provided the walls separating this portion from the theatre proper are carried up solidly to and through the roof, and that a fireproof exit is provided for the theatre on each tier, equal to the combined width of exits opening on opposite sides in each tier, communicating with balconies and staircases leading to the street in manner provided elsewhere in this section; said exit passages shall be entirely cut off by brick walls from said offices, stores or apartments, and the floors and ceilings in each tier shall be fireproof.

2. *Above Theatre.* Nothing herein contained shall prevent a roof garden, art gallery or rooms for similar purposes being placed above a theatre or public building, provided the floor of the same, forming the roof over such theatre or building, shall be constructed of iron or steel and fireproof materials, and that said floor shall have no covering boards or sleepers of wood, but shall be of tile or cement. Every roof over said garden or rooms shall have all supports and rafters of iron or steel, and be covered with glass or fireproof materials, or both, but no such roof garden, art gallery or room for any public purposes shall be placed over or above that portion of any theatre or other building which is used as a stage.

537. *Jurisdiction of Fire Commissioner.* The stand pipes, gas pipes, electric wires, hose, footlights and all apparatus for the extinguishing of fire or guarding against the same, as in this article specified, shall be in charge and under control of the fire department, and the fire commissioner is hereby directed to see that the provisions of this article relating thereto are carried out and enforced.

538. *Saving Clause.* The provisions of the foregoing article shall not be construed to mean or made to apply to any theatre, opera house or building intended to be used for theatrical or operatic purposes, lawfully erected prior to June 3, 1904.

CITY OF BOSTON.

THEATRES.

Definition.

Sect. 77. Every building hereafter erected so as to contain an audience hall and a stage, with curtain, movable or shifting scenery and machinery, adapted for the giving of plays, operas, spectacles or similar forms of entertainment, and of a size to provide seats for more than 500 spectators shall be a theatre within the meaning of this act. No existing building not now used as a theatre shall be altered and used as a theatre, unless it conforms to the provisions of this act for a new theatre.

Construction.

Sect. 78. Every theatre hereafter built shall be of fireproof construction throughout, except that the floor boards may be of wood, and the steel work of the stage, of the fly galleries, and of the rigging loft need not be fireproofed.

Open Courts.

Sect. 79. Every theatre built in a block not on a corner shall have an open court or passageway on both sides extending from the proscenium line to the line of the street on the front, or, in case the building abuts on a street both in front and rear, these passages may extend from the line of the front of the auditorium to the line of the rear street. These passages shall be at least 6 feet wide throughout their length, and shall not be closed by any locked gate or doorway. They shall immediately adjoin the auditorium, or a side passage or lobby directly connected therewith. These passages shall be open to the sky opposite the whole depth of the auditorium, but may be carried out to the street front or rear through passages inclosed by brick walls or other fireproof material equally efficient, and covered by a solid brick vault at least 8 inches thick, each passage to be not less than 8 feet wide and 10 feet high throughout.

Sect. 80. Every theatre built upon the corner of two streets shall have one inner court on the side of the building away from the side street, such court to be of the same description as the courts provided for in the preceding paragraph.

Stores, Etc.

Sect. 81. Nothing in this act shall be construed to prohibit the use of any part of a theatre building for stores, offices, or for habitation, provided that the parts so used shall be built with exits to the street entirely distinct from the rest of the building and shall be separated from the rest of the building by solid partitions or walls, without any openings in the same.

FLOOR LEVELS.

Sect. 82. In all theatres, the entrances shall be not more than one step above the level of the sidewalk of the main street, and the stage shall be not more than 5 feet above the said level.

PROSCENIUM WALL.

Sect. 83. The stage of every theatre shall be separated from the auditorium by a wall of fireproof construction, which wall shall extend the whole width of the auditorium and the whole height to the roof of the portion occupied by the stage. There shall be no openings through this wall except the curtain opening, one doorway each side behind the boxes, and one doorway which shall be located at or below the level of the stage. The doorways shall not exceed twenty-one superficial feet each, and shall have standard fire-doors hung in a manner satisfactory to the commissioner. The finish or decorative features around the curtain opening of every theatre shall be of fireproof material.

CURTAIN.

Sect. 84. The proscenium or curtain opening of every theatre shall have a fire-resisting curtain reinforced by wire netting or otherwise strengthened. If of iron, or similar heavy material, and made to lower from the top, it shall be so arranged as to be stopped securely at a height of seven feet above the stage floor, the remaining opening being closed by a curtain or valance of fire-resisting fabric.

STAGE FLOOR.

Sect. 85. The part of the stage floor, usually equal to the width of the proscenium opening, used in working scenery, traps or other mechanical apparatus, may be of wood, and no flooring used thereon shall be less than 1⅛ inch in thickness.

VENTILATORS.

Sect. 86. There shall be one or more ventilators near the center and above the highest part of the stage of every theatre, of a combined area of opening satisfactory to the commissioner, and not less than 1-10 of the area of the undivided floor space behind the curtain at the stage floor level. The openings in every such ventilator shall be closed by valves or louvres so counterbalanced as to open automatically, which shall be kept closed, when not in use, by a fusible link and cord reaching to the prompter's desk, and readily operated therefrom. Such cord shall be of combustible material, and so arranged that if it is severed the ventilator will open automatically.

Skylight coverings for ventilators shall have sheet metal frames set with double-thick glass, each pane thereof measuring not less than 300 square inches, or shall be protected with wire glass. If wire glass is not used, a suitable wire netting shall be placed immediately beneath the glass, but above the ventilator openings. Illuminating fix-

tures over the auditorium shall be suspended and secured in a manner approved by the commissioner.

Glass on illuminating fixtures over the auditorium shall be secured from danger of falling as the commissioner shall require, but in no case shall any glass more than 6 inches in diameter or length be hung over the auditorium unless protected from falling by a wire netting or similar device satisfactory to the commissioner.

SEATS IN AUDITORIUM.

Sect. 87. All seats in the auditorium excepting those contained in boxes shall be spaced not less than 30 inches from back to back, measured in a horizontal direction, and shall be firmly secured to the floor. No seat in the auditorium shall have more than six seats intervening between it and an aisle, on either side.

The platforms for seats in balconies and galleries shall nowhere have a greater rise than 21 inches, nor be less than 30 inches from back to back.

AISLES.

Sect. 88. All aisles on the respective floors in the auditorium, having seats on both sides of the same, shall be not less than 30 inches wide where they begin and shall be increased in width toward the exits in the ratio of 1 inch to 5 running feet. Aisles having seats on one side only shall be not less than 2 feet wide at their beginning and shall increase in width, the same as aisles having seats on both sides.

CHANGES IN LEVEL.

Sect. 89. All changes in the levels of the floors of such buildings, except under stairways, from story to story and except the necessary steps in galleries and balconies rising toward the exits, shall be made by inclines of no steeper gradient than two in ten within the auditorium, and rising toward the exits, and one in ten for all others.

LOBBIES.

Sect. 90. Preceding each division of the theatre there shall be foyers, lobbies, corridors, or passages, the aggregate capacity of which on each floor or gallery shall be sufficient to contain the whole number to be accommodated on such floor or gallery in the ratio of 1 square foot of floor room for each person.

STAGE DOORS.

Sect. 91. There shall be not less than two exit doors, each not less than 3 feet in width, located on opposite sides of the stage, and opening directly upon a street, alley, court, or courtway leading to a public thoroughfare.

ROOM EXITS.

Sect. 92. All rooms in theatres for the use of persons employed therein shall have passages to at least 2 independent means of exit.

DOORS TO OPEN OUTWARD.

Sect. 93. All doors of exit or entrance shall open outward, and shall be hung so as to swing in such a manner as not to become an obstruction in a passage or corridor, and no such doors shall be fastened so as to be inoperative when the building is occupied by an audience.

FALSE DOORS.

Sect. 94. No mirrors shall be so placed as to give the appearance of a doorway or exit, hallway, or corridor, nor shall there be any false doors or windows.

MAIN FLOOR AND FIRST GALLERY EXITS.

Sect. 95. A common exit may serve for the main floor of the auditorium and the first gallery, provided that its capacity be equal to the aggregate capacity of the outlets from the main floor and the said gallery; and provided that the lowermost run of any exit leading from a gallery shall not open directly at right angles with the central axis of a common exit unless there is a clear space or landing of at least 1¼ times the width of the exit between the foot of such exit and such center line or nearest exit doorway.

EXITS.

Sect. 96. Two distinct and separate exits shall be provided for each gallery and balcony above the main floor; and the same be located on opposite sides of the galleries.

All gallery or balcony exits shall start with a width of not less than 4 feet at the uppermost gallery.

Exits from balconies and galleries shall not communicate with the basement or cellar.

AGGREGATE WIDTH OF EXITS.

Sect. 97. The aggregate width of all the exits previously described shall be estimated on a basis of not less than 20 inches for every 100 persons for whom seats are provided in the sections of the auditorium served by the respective exits.

EMERGENCY EXITS.

Sect. 98. In addition to the exits previously described there shall be one exit from each side of each gallery, balcony, and main floor of auditorium, at least 5 feet wide, leading to exterior balconies not less than 4 feet wide and 20 feet long on each side of the auditorium. From such balconies there shall be staircases extending to the ground level, which may be counterweighted, with risers of not over 8½ inches and treads of not less than 9½ inches, exclusive of nosing. The aggregate width of these emergency stairs shall be not less than 10 inches for every 100 people served thereby, no single stairs being less than 30 inches wide. If counterweighted, these stairs shall be lowered during all performances.

Where all such stairs are in an interior court, each run shall be covered by a light awning of iron.

Nothing herein shall prohibit the building of emergency stairs and exits inside the walls of the building, provided that they are surrounded by a fireproof partition not less than 4 inches thick separating the exits and stairways from the audience room or auditorium.

ADDITIONAL REQUIREMENTS.

Sect. 99. The commissioner shall have power to require a greater number or capacity of exits than is herein prescribed.

In every theatre there shall be over every exit, on the inside, and over every opening to a fire escape, on the inside, an illuminated sign, bearing the word "exit" or "fire escape," respectively, in letters not less than 4 inches high. The lights for the exit signs, passages, stairs, lobbies, auditoriums, rear of auditoriums, balconies, galleries, and for the balconies and stairs outside the building, shall be so arranged that they can be turned on or off independently of the means provided on the stage or in any part of the building in the rear of the proscenium wall. Every exit sign shall be kept illuminated, and every outside balcony and fire escape shall be kept well lighted during the performance, except outside exits during a performance before sunset.

Plans showing the exits and stairways shall be legibly printed so as to occupy a full page of every programme or play-bill.

In said buildings there shall be such number of gas pipe outlets as the commissioner may require, fitted with no less than two gas burners. Such burners shall be inspected and tried at least once in every three months by inspectors of the department, to ascertain if they are in proper working order. The inspector shall make a report of each visit, stating the condition of the burners and the action of the inspector in regard to them.

The commissioner shall have authority to order any defect in the working of such burners as are necessary for public safety to be remedied.

So much of this section as applies to the inspection of gas burners shall appy to buildings now used as theatres.

STAIRS.

Sect. 100. The cut of the stair stringers shall not exceed 7½ inches rise, nor be less than 10½ inches tread. There shall be no flights of stairs of more than 15 or less than three steps between landings.

LANDINGS OF STAIRS.

Sect. 101. Every landing shall be at least 4 feet wide. When straight stairs return directly on themselves, a landing of the full width of both flights, without any steps, shall be provided. The outer

line of landings shall be curved to a radius of not less than 2 feet to avoid square angles. Stairs turning at an angle shall have a proper landing without winders introduced at the turn. No door shall open immediately upon a flight of stairs, but a landing at least 2 feet wider than the width of the door opening shall be provided between such stairs and such door. When two side flights connect with one main flight, no winders shall be introduced, and the width of the main flight shall be at least equal to the aggregate width of the side flights.

HAND-RAILS.

Sect. 102. All inclosed stairways shall have, on both sides, strong hand-rails, firmly secured to the wall, about 3 inches distant therefrom and about 3 feet high above the stairs.

All stairways 8 feet and over in width shall be provided with a central rail of metal or hard wood, not less than 2 inches in diameter, placed at a height of about 3 feet above the centre of the treads, supported on wrought metal or brass standards of sufficient strength, securely bolted to the treads or risers of the stairs; and at the head of each flight of stairs, and on each side of the landing, the post or standards shall be at least 6 feet in height, and the rail shall be secured to the post.

MEASUREMENTS FOR WIDTH OF STAIRS.

Sect. 103. The width of all stairs shall be measured in the clear between the hand-rails.

No winding or circular stairs shall be permitted.

RADIATORS FORBIDDEN IN PASSAGEWAYS.

Sect. 104. No coil or radiator or floor register shall be placed in any aisle or passageway used as an exit; but all such coils and radiators may be placed in recesses formed in the wall or partition to receive the same.

No boiler, furnace, engine or heating apparatus, except steam, hot water or hot air pipes or radiators, shall be located under the auditorium or under any passage or stairway or exit of any theatre.

SPRINKLERS AND STANDPIPES.

There shall be at least two 2-inch high-service standpipes on the stage of every theatre, with ample provision of hose nozzles at each level of the stage on each side, and the water shall be kept turned on during the occupation of the building by an audience. The said pipes shall in no case be sealed, and shall have two gates, one above the other, with a proper test or waste valve; the lower gate to be kept open at all times. The proscenium opening of every theatre shall be provided with a 2½ inch perforated iron pipe or equivalent equipment of automatic or open sprinklers, so constructed as to form, when in operation, a complete water curtain for the whole proscenium open-

ing, and there shall be for the rest of the stage a complete system of fire apparatus and perforated iron pipes, automatic or open sprinklers. Such pipes or sprinklers shall be supplied with water by high pressure service, and shall be at all times ready for use.

PLACES OF PUBLIC ASSEMBLY.

Sect. 105. Every building hereafter erected with a hall or assembly-room to contain a public audience of more than 800 persons, or with more than one superimposed gallery or balcony, shall be of fireproof construction throughout; except that halls or assembly-rooms, the mean level of the main floor of which is not more than 5 feet above the grade of the adjacent street, may have roofs of second class construction.

Every building hereafter erected with a hall or assembly-room to contain an audience of more than 600 persons, the main floor of which is raised more than 15 feet above the level of the principal street upon which it faces, shall be of fireproof construction throughout.

The capacity of a hall or assembly-room shall be estimated on the basis of 6 square feet for each person.

If several halls or assembly-rooms are provided in one building, their aggregate capacity shall be considered as determining whether or not the building shall be of fireproof construction, unless the several halls are inclosed by or separated from each other by fireproof walls, with fireproof doors in the same, in which case the building may be of second class construction.

No existing building shall be altered to contain a hall or assembly-room exceeding the foregoing dimensions, unless the whole building as altered shall conform to the provisions of this act.

All seats in places of public assemblage shall be spaced as hereinbefore provided, and, while such places of public assemblage are occupied by an audience, shall be secured in such manner as will be satisfactory to the building commissioner of the City of Boston. No temporary seats or other obstructions shall be allowed in any aisle, passageway or stairway of a place of public assemblage, and no person shall remain in any aisle, passageway or stairway of any building during any performance.

Every existing building containing a hall or assembly-room to which admission is not free, and to which the provisions of chapter 494 of the acts of the year 1908, relative to the licensing of public entertainments apply, shall have all the ways of egress from such building sufficiently lighted, and lighted in a manner satisfactory to the building commissioner, while the hall or assembly room is occupied by an audience.

MOVING PICTURE SHOWS.

Sect. 106. All moving picture shows shall be subject to the provisions of chapter 176 and of chapter 437 of the acts of the year 1905,

and of any amendments thereof or additions thereto now or hereafter made.

EXITS, ETC.

Sect. 107. Every building hereafter erected containing a hall or assembly-room shall conform to all the aforesaid requirements as to exits, stairways, exit lights, aisles, and seats, which apply to theatres; provided, that the same are necessary for the preservation of public safety and are specially ordered by the building commissioner. All orders of the building commissioner under the provisions of this section shall be subject to the authority of a majority of the Board of Appeal, which may annul or modify such orders.

ROOF GARDENS.

Sect. 108. Nothing herein contained shall prevent the placing of a roof garden, art gallery, or rooms for similar purposes above a theatre, provided the floor of the same forming the roof over such theatre shall be constructed of fireproof materials, and shall have no covering boards or sleepers of wood. Every roof over such garden or other rooms shall have all supports and rafters of steel, and, if covered, shall be covered with glass or fireproof material, or both.

EXITS FROM ROOF GARDENS.

Sect. 109. Exits from roof gardens may communicate with stairs leading from the auditorium of the theatre, but they shall be at least 4 in number, not less than 4 feet 6 inches wide, and distinct and separate from each other from roof to street.

SUMMER THEATRES.

Sect. 110. Summer theatres, if built without the building limits, and located 30 feet distant from any other building or structure or adjoining lot lines, and of no greater seating capacity than 750 persons, and not more than 1 story high, without balconies or galleries, may be constructed as follows:

The auditorium, without a cellar or basement, with open sides of double the number of exits as hereinbefore provided, opening directly into the surrounding courts or gardens at the grade level, and the adjoining dressing-rooms, may be of wooden construction, but the stage shall be inclosed in brick walls not less than 12 inches thick, or shall be plastered on metal lathing throughout; provided, that the openings leading to the dressng-rooms shall be provided with fire doors.

Otherwise, all protective features and arrangements shall comply with all previous sections of this title.

EXISTING THEATRES.

Sect. 111. All stairs of theatres shall have throughout proper hand-rails on both sides firmly secured to walls or to strong posts and balusters.

Stairways 12 feet or more wide shall have one or more intermediate rails not more than 8 feet apart and properly supported.

No boiler, furnace, engine or heating apparatus, except steam, hot water or hot air pipes or radiators, shall be located under the auditorium nor under any passage or stairway or exit of any theatre.

In every theatre shall be over every exit, on the inside, and over every opening to a fire escape, on the inside, an illuminated sign, bearing the word "exit" or "fire escape," respectively, in letters not less than 4 inches high. An emergency arc light or its equivalent shall be installed in the auditorium, which light or lights, exit lights, and all lights in halls, corridors or any part of the building used by the audience, except the general auditorium lighting, shall be fed independently of the stage lighting, and shall be controlled only from the lobby or other convenient place in the front of the house. Every exit sign shall be kept illuminated and every outside balcony and fire escape shall be kept well lighted during the performance, except outside exits during a performance in the daytime and before sunset.

The exits and openings to fire escapes of all theatres shall open outward and have fastenings on the inside only. They shall be unfastened during every performance and shall be so arranged that they can easily be opened from within. Plans showing the exits and stairways shall be legibly printed so as to occupy a full page of every programme or play-bill.

No temporary seats or other obstructions shall be allowed in any aisle or stairway of a theatre, and no person shall remain in any aisle, passageway or stairway of any such building during any performance.

The proscenium or curtain opening of every theatre shall have a fire-resisting curtain of incombustible material, reinforced by wire netting, or otherwise strengthened. If of iron, or similar heavy material, and made to lower from the top, it shall be so arranged as to be stopped securely at a height of 7 feet above the stage floor, the remaining opening being closed by a curtain or valance or fire-resisting fabric. The curtain shall be raised at the beginning and lowered at the end of every performance, and shall be of proper material, construction and mechanism.

There shall be one or more ventilators near the centre and above the highest part of the stage of every theatre, of a combined area of opening satisfactory to the building commissioner, and not less than 1-10 of the area of the proscenium opening. Every such ventilator shall have a valve or louvre so counterbalanced as to open automatically, and shall be kept closed, when not in use, by a fusible link and cord reaching to the prompter's desk, or any other place easily reached from the stage level and readily operated therefrom. Such cord shall

be of combustible material, and so arranged that if it is severed the ventilator will open automatically.

There shall be at least two 2-inch high-service standpipes on the stage of every theatre, with ample provisions of hose nozzles at each level of the stage on each side, and the water shall be kept turned on during the occupation of the building by an audience. The said pipes shall in no case be sealed and shall have a gate and check valve and shall have a test valve placed between the gate valve and check valve. The proscenium opening of every theatre shall be provided with a 2½-inch perforated iron pipe or equivalent equipment of automatic or open sprinklers, as the commissioner may direct, so constructed as to form when in operation a complete water curtain for the whole proscenium opening, and there shall be for the rest of the stage a complete system of fire apparatus and perforated iron pipes automatic or open sprinklers. Such pipes or sprinklers shall be supplied with water by high-pressure service, and shall be ready for use at all times.

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A Card from the Author

The writer of this book, a widely traveled and experienced theatre specialist, is a member of the Society of Motion Picture Engineers and a firm believer in the essential doctrine advocated by that body, that the advancement of motion picture engineering and its allied arts and sciences requires for complete efficiency and economy a standardization of the mechanism and practices employed therein, such as safer machine booths, flatter projection and the remedying of similar technical defects that exist as the result of blind imitation in the absence of expert knowledge.

The writer also believes that architectural elegance and structural economy in theater construction depend upon the individuality and simplicity of design; and that the safety of the structure and its inmates are secured at a minor increase in the cost of construction by the entire employment of cheap, recognized fire-resisting materials and sane regulations.

In a humble effort for artistic and practical improvement the writer volunteers to prepare and execute for prospective patrons who contemplate the erection of a photoplay house a complete set of one-eighth scale preliminary plans of individual and characteristic design for one hundred dollars (barely the cost of production) with a carefully tabulated list of necessary building materials, said drawings to comprise six distinct plans: a front elevation or façade, a side elevation and façade, if the building be located on a corner; a longitudinal section of the entire structure, a combination transverse section presenting a stage and balcony view of the auditorium, a main floor plan and a balcony plan indicating the seating arrangement.

This sum of one hundred dollars is to be payable in two payments, half, or fifty dollars, in advance as a retainer, and the balance of fifty dollars upon delivery of the drawings. Where the proposed house is of the smaller type without balcony, requiring two plans less, the charge will be but seventy-five dollars, half payable in advance and the remaining half upon delivery. A general description and a topographical survey of the site will be necessary before plans can be drawn.

These plans will clearly show the size and character of the proposed building, and are amply sufficient with the building material list furnished with them for securing accurate estimates for builders' bids.

Sincerely,

EDWARD BERNARD KINSILA,
39-41 West Twenty-seventh Street,
New York City.